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EMERGENCY DEPARTMENT GROUPS CLASSIFICATION SYSTEM: AN EVALUATION FOR MILITARY HEALTH CARE USE

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(U) The purpose of this study was to evaluate the Emergency Department Groups (EDGs) for military implementation. In response to a congressional mandate that the Department of Defense allocate resources based on a diagnosis related groups (DRGs) outpatient type system, a team of researchers from the U.S. Army Medical Department Center and School, Directorate of Health Care Studies and Clinical Investigation evaluated the major ambulatory classification reimbursement systems.

The data used for the evaluation consisted of two samples of data derived from the Army's Ambulatory Care Data Base (ACDB) Study (Georgoulakis et. al., 1988). The first sample (Sample 1) consisted of 516,006 visits. The second sample (Sample 2--Emergency Department Sample) contained 22,790 ED visits. The data contained in the ACDB was collected from six Army Medical treatment facilities (MTFs) and are considered representative of Army medical department health care. The larger sample was evaluated because of the team's concern that the triaging of non-emergent, walk-in patients to other ambulatory and speciality clinics may have biased the ED sample. Additionally, communications with the developer of the EDGs

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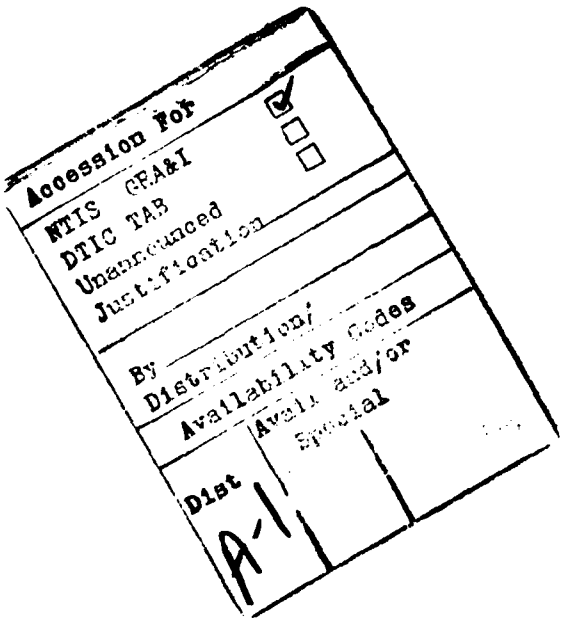

EXECUTIVE SUMMARY

The purpose of this study was to evaluate the Emergency Department Groups (EDGs) for military implementation. In response to a congressional mandate that the Department of Defense allocate resources based on a diagnosis related groups (DRGs) outpatient type system, a team of researchers from the U.S. Army Medical Department Center and School, Directorate of Health Care Studies and Clinical Investigation evaluated the major ambulatory classification reimbursement systems. Specifically, the study team evaluated the Products of Ambulatory Care (PAC) developed by the New York State Health Department (Tenan et al., 1988), the Ambulatory Visit Groups (AVGs) formulated by a group at Yale University (Fetter, 1980), the Products of Ambulatory Surgery (PAS) created by the New York State Department of Health (Fillmore et al., 1991), the Ambulatory Patient Groups (APGs) developed by 3M HIS (Averill et al., 1990), and the Ambulatory Care Groups (ACGs) created at John Hopkins University (Weiner, Starfield, Steinwachs, & Mumford, 1991).

The data base used for all evaluations consisted of a sample of data derived from the Army's Ambulatory Care Data Base (ACDB) Study (Georgoulakis et al., 1988). The ACDB study was conducted over a 21-month period (January 1986 to September 1987) during which over 3.1 million patient visits were recorded from six study hospitals. These visits represented care provided by more than 4,000 health care providers in some 50 clinical specialties.

The six Army medical treatment facilities (MTFs) selected for the study, having diverse missions and populations, constituted a representative sample of Army medical department health care. The six sites were Brooke Army Medical Center, Fort Sam Houston, Texas, Womack Army Medical Center, Fort Bragg, North Carolina, Moncrief Army Community Hospital, Fort Jackson, South Carolina, Bayne-Jones Army Community Hospital, Fort Polk, Louisiana, Blanchfield Army Community Hospital, Fort Campbell, Kentucky, and Fox Army Community Hospital, Redstone Arsenal, Alabama.

The study team utilized two samples of data from the Army medical department's ACDB to evaluate the EDGs. The first sample (Sample 1) consisted of 516,006 visits from six MTFs. The second sample (Sample 2 - Emergency Department (ED) Sample) contained 22,790 ED visits from the same MTFs. The larger sample was evaluated because of the team's concern that the triaging of non-emergent, walk-in patients to other ambulatory and specialty clinics may have biased the ED sample. Additionally, communications with the developer of the EDGs indicated that the system could be utilized for all ambulatory visits regardless of the site of care.

Preparation for the evaluation included recoding and mapping some of the diagnosis and procedure codes into the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), the Physicians' Current Procedural Terminology, Fourth Edition (CPT-4) codes (1985, 1990), and the Physicians' Current Procedural Terminology (1990) codes.

The criteria designed to evaluate the EDGs were (a) clinical meaningfulness (i.e., from a clinical perspective did the groups make sense), (b) administrative ease of implementation, (c) statistical analysis of the grouper results, and (d) military applicability. The Ambulatory Classification Evaluation Study (ACES) team found that the EDGs were partitioned using sound medical logic, but the grouping algorithm may be too complex. The EDG software is a PC program with the ability to process over 500,000 ACDB records. The EDGs grouped 99% of the ED sample and 98% of Sample 1. Those records which did not group to any EDG generally contained a coding error. However, many of the EDGs could not be filled with the ACDB records due to "administrative" problems. The data variables needed to successfully group data with the EDG grouper are more extensive than those routinely collected for third party payers. They also require prior familiarity with the grouper and careful ranking of severity of primary and secondary diagnoses by the providers.

Since the military does not have a cost accounting system for each visit accounting system, the study team developed several different costing methodologies for testing the classification system. The four costing methodologies were applied to the EDGs to permit analyses on the effectiveness of the grouper as a resource allocation system. A General Linear Model (GLM) statistical procedure contained in the Statistical Analysis System (SAS) was employed to measure the systems effectiveness with the cost methodologies.

The amount of variance explained by the cost methodologies varied according to the cost formula used. In general, the grouper appeared most effective when using COST4, complete military cost, and the least effective when using COST3, labor cost only. Table A contains the ranges of variances explained by the cost formulas using the emergency department sample.

TABLE A Emergency Department Sample R-Square Ranges

	UNTRIMMED	3 SD	2 SD
COST	0.07-0.14	0.10-0.15	0.19-0.22
LOGCOST	0.10-0.14	0.11-0.16	0.16-0.21

Results of analyses of variation on Sample 1 using ACES cost formulas are summarized in Table B.

TABLE B Sample 1 R-Square Ranges

	UNTRIMMED	3 SD	2 SD
COST	0.07-0.09	0.10-0.14	0.13-0.20
LOGCOST	0.08-0.14	0.09-0.18	0.10-0.22

These low r-squares may be due to a number of factors. The ACES cost formulas are in a rudimentary form and may not fully account for all costs associated with a visit. Additionally, the EDG cost methodology is largely charge-based and the ACES cost methodology represents a mixture of charge and cost data. Finally, there is an inherent difficulty in applying any grouper to a different sample than that from which it was developed. In an attempt to address some of these identified difficulties, the ACES team has applied the same bias effect of the cost methodologies (if they exist) to all ambulatory patient classification systems under study.

The implementation of any prospective payment system for ambulatory care would be more difficult than that experienced with DRGs in the inpatient setting. Experience and use of diagnostic procedural coding in the ambulatory setting is limited. Currently, hospital based ambulatory clinics lack the ability to link departmental cost and billing data to patient clinical data. Hospital Outpatient Departments (OPDs) would have to develop automated systems to link financial and clinical data. An automated system for the gathering of grouper variables would be essential. The ACDB study found that providers were often unwilling to duplicate their documentation requirements, which in some instances led to inconsistent data collection. A single system would have to be developed to serve both as a medical record and a data collection instrument so that providers do not have to duplicate information. Because military providers tend to be unfamiliar with coding issues, they would have to be trained to become proficient using both ICD-9-CM and CPT codes. To use the EDG system, providers would need additional training in collecting required variables that are more extensive than usual and that are essential for appropriate grouping. The use of trained personnel to gather the variable information from the records would be very time consuming, expensive, and error prone. It seems likely that errors would be a particular problem in assigning procedures to the appropriate CPT code.

The meaningful implementation of any outpatient payment system, for the military or civilian community, requires the development of a standard costing methodology. The developers of patient classification systems use standard coding such as CPT-4 codes and ICD-9-CM codes to develop patient groupers that are clinically meaningful. However, the primary purpose of these systems is for prospective ambulatory payment. In order for these systems to accurately capture the cost of an ambulatory visit, the development of a standardized costing methodology is critical Unfortunately, the present charge based methodology provides an inaccurate measure of cost. Without an accurate cost methodology, the reliability of any ambulatory classification system cannot be accurately assessed.

ACKNOWLEDGMENTS

The evaluation of the Emergency Department Group (EDG) required the contributions of a number of individuals. It would be impossible to acknowledge all the military and civilian employees who contributed to the successful and unprecedented ambulatory data collection process. Without their assistance the EDGs could not have been evaluated in a military health care environment.

The former Commander of HCSCIA, Colonel David A. McFarling, M.D., and former Deputy Commander Gregory C. Meyer, have provided not only support but have maintained a keen interest in the EDGs. The Chief of the Health Care Studies Division, Colonel Norris F. Jesse, has not only been instrumental in project coordination, but has been the "Best Boss" anyone could work for. His willingness to assist in any way possible was crucial to the successful completion of the study.

We wish to thank our research assistant, Michelle Lee, who kept us on track and always found the energy and enthusiasm to help. In addition, appreciation is extended to Mrs. Rhonda Barrett of the CDSI Corporation and Mrs. Jeri Battle of Social Work Servies, Fort Hood, Texas for typing and retyping the report. Special thanks is given to Mrs. Beverly Rakowitz, the DHCSCI librarian, who provided numerous recommendations to improve the report. A special acknowledgment of deepest gratitude to Elena Selles of the CDSI Corporation, not only for her programming support and assistance, but especially for her patience in working with a "difficult" study director. A final thanks to the present Director of HCSCIA, Colonel William B. York, Jr., for his support and interest in the application of ambulatory reimbursement systems to the Military Health Care System.

INTRODUCTION

In the 1986 Omnibus Budget Reconciliation Act (OBRA), Congress directed the Health Care Financing Administration (HCFA) to develop an outpatient prospective payment system (PPS) for the facility component of Medicare. This directive was based on the success of Medicare's inpatient facility PPS in controlling Medicare expenditures. In accordance with this mandate, HCFA issued grants to various organizations to develop a PPS for the facility component of ambulatory care. Based on this directive, Congress, in the National Defense Appropriation Act of 1987 (NDA 1987, P.L. 99-661. Sec. 701, USC 1101), instructed the Department of Defense (DOD) to revise the method of allocating resources within the military health care system. The act specified that DOD implement a Diagnosis Related Groups (DRGs) type system to allocate resources to its medical treatment facilities (MTFs). The system for inpatient care was scheduled for implementation on 1 October 1987, but was not implemented until 1 October 1988. The system for outpatient facility resource allocation was initially scheduled for implementation on 1 October 1988. However, recognizing the challenges in developing an ambulatory classification system, Congress, in subsequent National Defense Authorization Acts for fiscal years 1989-1991, extended the deadline for the implementation of an outpatient system until 1 October 1993. At the time of this report, May 1993, Congress had not selected an outpatient PPS.

PURPOSE OF THE STUDY

To assist the DOD in meeting the objectives of the congressional mandate and to study the potential impact of a new method of allocating resources, the U.S. Army Medical Department initiated the Ambulatory Classification Evaluation Study (ACES). The purpose of the study was to review the available ambulatory classification systems for possible implementation by the military. The ACES study team utilized military data collected from the Army Surgeon General's Ambulatory Care Data Base (ACDB) study (Georgoulakis et al., 1988).

DEVELOPMENT OF THE EMERGENCY DEPARTMENT GROUPS

The HCFA provided a grant to Health Systems Research, Inc. (HSR, Inc.) to develop a visit specific ambulatory patient classification system. HSR, Inc. developed the Emergency Department Groups (EDGs) classification system which is intended to be applicable to all patient visits to hospital emergency departments (EDs). Their goal was the creation of an ambulatory classification system comprised of clinically similar groups that were homogeneous in terms of resource consumption. These groups would allow hospitals to associate resource use with specific

ambulatory patients. The defining patient attributes were intended to explain a substantial portion of the variation of resource use among patients. Groupings were to be made along clinical lines so that the output would be meaningful to both clinicians and administrators.

METHODOLOGY

Data Collection

The hospitals, utilized in the data collection process, reportedly served a broad mix of patients. Their EDs were intended to represent modern, busy, and urban emergency settings. HSR, Inc. stated that the study hospitals were not trauma centers, but did not specify the level of the Emergency Medical System (EMS). Therefore, the EDs were either level II or level III centers.

Three data collection activities were undertaken at these hospitals. They included the following:

1. Medical records were examined to derive patient demo-graphics, information pertinent to the clinical characteristics of each patient including ICD-9-CM diagnoses, "reason for visit," vital signs, mode of arrival, and physician information.

2. Patient billing data was used to detail each patient's utilization of physician and hospital services during the ED visit.

3. A patient-provider time study was conducted to collect information on time spent with a patient.

The data was reviewed and some corrections/revisions were made. For example, primary and secondary diagnoses were reviewed to ensure that the diagnoses listed as primary were indeed the more serious diagnoses. Serious diagnoses such as acute myocardial infarction, malignant hypertension, heart failure, and pulmonary edema were given priority over such diagnoses as anxiety, dermatitis, and headache when these diagnoses co-existed on the ED record. A computer program was developed to prioritize diagnoses in the patient records. The final data base consisted of a sample of 19,739 patient records.

Partitioning Guidelines

The patient visits were divided into eight major diagnostic categories (MDCs), plus a ninth category for patient visits that could not logically be grouped with the other eight (follow-up visits, administrative visits, etc.) Each MDC was then partitioned into three subgroups based on discharge disposition:

(a) home/other non-acute, (b) transfer-acute (meaning the patient was transferred to another acute care hospital), and (c) admit patient to hospital. A summary of the number of EDGs by MDC and disposition category is contained in Table 1.

TABLE 1 Number and Percent of EDGs by Major Diagnostic Category and Patient Disposition Classification

MDC Number	Major Diagnostic Category (MDC)	Number of EDGs by Patient Disposition					Percent of Total
		Home	Transfer	Admit	Expired	Total	
1	Trauma and Poisoning	39	12	12	1	64	29.63
2	Cardiopulmonary	21	3	16	1	41	18.98
3	Gastrointestinal	16	3	7	0	26	12.04
4	Genitourinary	8	1	1	0	10	4.63
5	Obstetrics, Gynecology and Newborn	7	1	4	0	12	5.56
6	Neurologic and Psychiatric	13	5	7	0	25	11.57
7	Eye, Ear and Nose	7	1	1	0	9	4.17
8	Skin and Musculoskeletal	7	2	2	0	11	5.09
9	Follow-Up, Administrative and Misc.	10	2	6	0	18	8.33
TOTAL		128	30	56	2	216	100.00

The categories were then subjected to a step-wise partitioning process using a cluster analysis technique (the AUTOGRP interactive statistical system) in order to partition sets of observations into logical subgroups. Criteria used to guide the clustering process were as follows:

1. **MEDICAL JUDGMENT**. Medical judgment and coherence were given priority over statistical considerations so that medically sound groups would be developed.

2. **VARIABLE SELECTION**. Only variables relating to the medical condition of the patient were used, not what services were utilized. Variables were limited to those that could be easily extracted from the medical record and included *diagnosis coded in ICD-9-CM, discharge disposition, age, and indicators related to trauma*.
3. **LIMITED NUMBER OF DEFINING VARIABLES**. Variables were limited so that hospitals could easily capture and automate necessary information.
4. **ORDER PREFERENCE IN PARTITIONING**. Partitioning of each MDC followed a similar pattern in terms of the variables entering the decision sequence.
5. **STATISTICAL DIFFERENCES**. The goal was to develop sub-groups that were significantly different in terms of the dependent variable (e.g., total direct cost).
6. **COEFFICIENTS OF VARIATION**. Terminal groups were to have coefficients of variation less than 1.0.

Patient Classification

After the nine MDCs were partitioned into the three disposition subgroups (home/nonacute, transfer, and admit), they were further partitioned using a systematic decision sequence. Disposition was used as a surrogate for severity of patient disorders. HSR, Inc. noted that the cost of care for patients admitted to an inpatient setting was the highest, followed by patients who were transferred to other acute care hospitals, while those patients who were sent home were associated with the least cost. Patients discharged to home from the ED were always partitioned first by primary diagnosis. For five of the MDCs, patients who were admitted or transferred were first partitioned based on the presence of a "critical care physician procedure." These were procedures used in life-threatening situations and were thought to indicate critically ill patients. They included CPR, cardioversion, endotracheal intubation, thoracotomy, thoracostomy, pericardiocentesis, insertion of pacemaker, cutdown venepuncture, central venous pressure line placement, and peritoneal lavage. Nontrauma patients in the admit and transfer subgroups were then partitioned using primary "principal" diagnosis as the third variable. Trauma patients in the admit and transfer subgroups were partitioned using the presence of penetrating trauma as the next variable, followed by primary diagnosis. For trauma patients, the presence of penetrating trauma was the next variable followed by primary diagnosis. The process of patient classification was iterative and interactive involving both medical and statistical criteria. MDC 1, Trauma and Poisoning, comprised the largest MDC in terms of patient numbers and the number of terminal groups. Age was not used as a partitioning variable for MDC 1. Secondary diagnoses were frequently employed as they indicated "other injuries." Patients with multiple injuries consumed greater resources than those with single injuries. Open wounds were separated into "simple" or "complex"

based on length and depth of the wound. Simple included non-facial wounds repaired by sutures of up to 12.5 cm. Facial wounds were limited to 5.0 cm. Complex was used for suture repair of all other open wounds. "Trauma and Poisoning" was divided into 64 terminal groups: 40 within the discharge to home/other nonacute category, 12 in the transfer, and 12 in the admit category. For the other eight MDCs, primary diagnosis and age were the two most important variables. Age was divided into three categories: 0-35, 36-64, and 65+. It was thought that age could serve as a surrogate for severity in a number of patient disorders. For example, hypertension is more difficult to manage in the elderly. Similarly, the work-up of chest pain of unknown etiology in the under 35 age group would probably be more oriented to respiratory causes while in the over 36 age group, cardiac etiology would be of greater concern. Where age was used to divide subgroups, it always followed primary diagnosis. Presence or absence of a secondary diagnosis was used as a partitioning variable in (a) esophagus and stomach disorders, (b) convulsions, (c) urinary tract infections, and (d) trauma because these disorders often present in EDs with complications and comorbidities. The partitioning process resulted in the formation of 216 EDGs which are mutually exclusive and exhaustive. Thus, a patient is assigned to one and only one EDG. All possible ICD-9-CM diagnosis codes (except those specified as invalid for ED visits) were assigned to MDCs and then to EDGs. There is an automated "grouper" algorithm which allows for any data set containing the essential variables to be assigned to the EDGs. In order to test the differences between and within the groups, an Analysis of Variance (ANOVA) procedure was conducted on the sample. After trimming the final group distribution at three standard directions from the mean, the "overall reduction" in variance of the dependent variable (total direct cost) achieved for the EDGs (trimmed for outliers) was .63 (i.e., 63% of overall variance was explained). When patients in the admitted EDGs were deleted, the EDGs explained 52% of the variance in total direct costs. Patients who were admitted from the ED were associated with the most costs. Outpatients who are admitted may be covered by the inpatient classification system (i.e., the Diagnosis Related Groups). (See Appendix A for a list of the EDGs.)

Development Of Cost Methodology

Measures of "costs" of services were developed to include physician costs, ED costs, and ancillary service-costs. These costs were derived from charge data. Those costs that were thought to be influenced by patient characteristics were selected. Hospital overhead costs were excluded because they did not vary with patient characteristics. Patient charges were used to estimate costs for ancillary services using department-specific cost-to-charge ratios. To account for provider time (costs), a provider time study was conducted. The results of

this study provided the basis for valuing physician and nonphysician time for the larger sample on which no time study was conducted. Other ED costs were accumulated on a patient-specific basis. The three major cost components (a) physician costs, (b) ED costs, and (c) ancillary service costs were used as the dependent variable for the ANOVA. They comprised the dependent variable for analysis (i.e., total direct costs).

Total direct cost was divided into two components for each EDG. These were "physician cost" and "hospital cost" which gives three sets of EDG relative values: (a) the physician component, (b) the hospital component, and (c) the combined values. Relative values were derived from the following formula:

$$\text{Relative value} = \frac{\text{average cost per group}}{\text{average cost for all patients}}$$

Relative values indicate the expected average relative differences in resource use between groups, and are not to be used for establishing actual costs. Costs are expected to vary greatly from one setting to the next, whereas the relative differences in resource use among patient types are expected to remain relatively constant from one setting to the next. HSR, Inc. expects the relative values, or weights, to be helpful to hospitals for estimating and comparing case-mix. The relative values for physician and hospital resource use were not the same and were often quite different depending on the patient's condition. HSR, Inc. suggests that a given hospital may convert the EDG relative values to its own weights using actual costs. The hospital would first assign all of its ED patients to EDGs for the base year. Then it would calculate the average total hospital cost per ED visit (ED plus ancillary costs), excluding patients who are admitted (DRGs cover these). Each patient's EDG relative value is then multiplied by the average total cost per visit and the results are summed. This value is then divided by the total number of non-admitted patients yielding the hospital specific ratio. The costs per case derived for the base year trended forward for inflation would serve as the basis for cost control measures for the following year.

The average cost per group for physician services could be estimated using the physician relative values, but when time is an insufficient proxy for value as in cases involving critical patients, other weights may need to be used. HSR, Inc. suggests that the relative value of certain EDGs may need to be modified to reflect patient criticality.

EVALUATION OF THE EDGS

Introduction

Emergency Medicine in the Military

Emergency medicine in the military health care system has in common with the civilian sector responsibility for assessing and treating all patients presenting with physical or psychiatric conditions that are perceived to be potentially life, limb, or function threatening. These conditions are primarily episodic in nature and their management constitutes the primary mission of an ED.

The military ED differs from the civilian sector ED in that it must support overall operational readiness and serve as a key resource for rapid wartime mobilization and combat medical support. Another difference in the Army ED is that during regular clinic hours non-critical patients who are present in the Emergency Room (ER) are often triaged to the appropriate specialty clinic or to an acute care clinic (which may operate under a variety of names and serve patients with mild or non-acute problems). These clinics are accustomed to dealing with walk-ins, whether they come directly to the clinic or referred from the ER. Some of the clinics are open for extended hours which may have biased the sample used in the study. For example, at one site the Pediatric Clinic remained open in the evening during weekdays and for several hours during the day on the weekends and holidays. The OB-GYN Clinic also had extended hours of operation, and the Acute Care Clinic was open until 11:00 p.m. weekdays. As will be discussed later, the widespread practice of triaging patients to non-ED ambulatory clinics was recognized during the evaluation of the EDG system.

METHODOLOGY

Sample

An effective evaluation of any ambulatory classification system is best accomplished through the use of a large data base containing a diversity of patients (i.e., age and gender) and types of visit (i.e., procedures and diagnoses). The ACES team used a sample of data from the Army Medical Department's Ambulatory Care Data Base (ACDB) study which met these requirements (Georgoulakis et al., 1988). Researchers conducting the ACDB study collected clinical data on visits from all outpatient departments. During the 21-month data collection phase of the study, over 3.1 million patient visits were recorded from six study hospitals. These visits represented care provided by more than 4,000 health care providers across all Army outpatient medical specialties. For the purpose of this study, the re-

searchers randomly selected 516,006 visits from the 3.1 million visits contained in the data base. This data is referred to as Sample 1.

Data Collection Instruments

Because of the magnitude of the project, Mark Sense Technology was selected as the most appropriate and cost efficient method of data collection. Mark Sense Technology allows for pencil entries to be electronically scanned for data and subsequently entered into a computerized data base. In order to gain the most benefit from the study, a data collection form was developed for each specialty. The patient collection instruments consisted of the same categories of data elements across all specialties. The forms contained four sections. The first section was completed by the patient and consisted of identifying information (e.g., social security number, age). The second section contained administrative information that was completed by the clinic receptionist or secretary. An example of this type of information is the location of visit (e.g., clinic, ward, home, etc.) The third and fourth sections required completion by health care providers. Elements in this section included length of time spent with the patient, diagnoses and procedures, disposition, etc.

Study Hospitals

The six hospitals selected for the study, having diverse missions and populations, constituted a representative sample of Army Medical Department health care. Collectively, these hospitals serve a catchment area population of nearly a half million (424,000) beneficiaries. For example, Brooke Army Medical Center (BAMC), Fort Sam Houston (San Antonio), Texas, is a 500-bed facility that, in addition to providing a complete array of outpatient services, is a teaching hospital and operates a Level I trauma center. BAMC serves over 17,000 active duty military personnel, 53,000 military family members, and 39,000 retired military beneficiaries (Annals of Emergency. Medicine, 1989). Additionally, BAMC serves as one of three trauma centers in San Antonio, accepting all unstable civilian emergencies within its geographic catchment area. Womack Army Medical Center, Fort Bragg (Fayetteville), North Carolina, is a 300-bed facility and, in addition to providing extensive outpatient services, contains a Level II trauma center. Womack provides care to the 82nd Airborne Division as well as large family member and retired military populations. The total population served is in excess of 125,000 beneficiaries. The remaining four hospitals in the study operate Level III emergency departments. Moncrief Army Community Hospital, Fort Jackson (Columbia), South Carolina, provides access to a large population of basic trainees, some tenant troops (troops who have their headquarters at a different installation), retirees, and family members. Moncrief also provides a full array of outpatient services and operates 175

beds. Moncrief's catchment population contains slightly more than 55,000 beneficiaries. Blanchfield Army Community Hospital, Fort Campbell (Clarksville), Kentucky, is a 200-bed facility and provides services to the 101st Airborne Division, family members, and a retired population. The beneficiary population of Blanchfield is approximately 70,000. Bayne-Jones Army Community Hospital, Fort Polk (Leesville), Louisiana, operates 150 beds, as well as, provides a full array of outpatient services to service members, their families, and retirees. Bayne-Jones catchment population is around 40,000. The final medical treatment facility included in the study was Fox Army Community Hospital at Redstone Arsenal in Huntsville, Alabama. This hospital serves a stable military and beneficiary population of approximately 25,000 individuals. Fox primarily provides outpatient services and is a 100-bed facility.

Clinical Reliability of the Data

To provide an accurate and objective assessment of the quality of the data collected in the ACDB, a standardized scoring instrument was developed. Utilizing a modified Delphi technique (Polit & Hungler, 1983), the most important administrative and clinical data elements collected in the patient visits was determined. Each of the data elements was then discussed, rank ordered, and assigned a relative value in terms of importance to the study. Using this weighing process, members of the study group selected three administrative and two clinical data elements. The data elements which represented the administrative area included the sponsor's social security number with the patient's family member prefix, the date of visit, and the clinic code. The selected clinical data elements consisted of the primary diagnosis, procedure, code, and the health care provider identification code. Following a pilot study, a sample of 9,015 medical records were compared with the ACDB records. An analysis of the records indicated a mean score of 10.56 (11 was the maximum score) and a standard deviation of 1.27. This indicates an extremely high degree of reliability between the medical record and the ACDB record.

Diagnostic and Procedural Code Remapping

Under the direction of the physician member of the Ambulatory Classification Evaluation Study (ACES) staff, the diagnosis and procedure codes that were extended in the ACDB study were recoded into conventional ICD-9-CM and CPT nomenclature. Consultants from various specialties assisted in recoding more esoteric procedures. Clinical department chiefs at BAMC provided most consultations. The proximity of BAMC simplified in-person and telephonic consultations.

Unfortunately, many consultants were unfamiliar with CPT codes, so they provided information that the staff physician used

to recode the extended procedure codes. In these cases, the consultants did not provide the actual codes, but their input assisted the staff physician in making selections. This method of code selection offered greater uniformity and reduced specialty bias in the recoding process.

Some procedures listed on the data collection forms were more specific and some less specific than those in CPT. When the listed procedure possessed multiple CPT counterparts, a CPT code of common or medium technical weight was assigned. This is especially evident in assignment of codes for surgical procedures. CPT specifies surgical procedures by anatomical site, and the ACDB clinical data does not.

The lists of codes for diagnoses were developed based on ICD-9-CM. Additional codes were created so that more specificity regarding diagnoses could be captured. Although these expanded codes provided valuable information, they presented a problem in that the algorithms being used for classification recognized only valid ICD-9-CM codes. Therefore, it was necessary to recode any modified diagnosis codes to the most equivalent ICD-9-CM code.

During the ACDB study, a total of 5,990 different diagnosis codes were utilized. Of these codes, a little less than one third (1,890) were modified ICD-9-CM codes.

Under contract, two companies, Code 3 and Health Systems International, recoded the extended diagnosis and procedure codes to the appropriate ICD-9-CM and CPT classification system. This involved approximately 70% of the diagnoses and procedures that required coding. In most cases, Code 3 coding of diagnoses was used. Specialty areas either not coded or only partially coded by Code 3 were Nutrition Care, Social Work, Psychology, Occupational Therapy, and those portions of Physical Therapy and Orthopedics associated with appliances and durable medical equipment.

Of the 1,890 modified codes, 101 were from the Social Work forms. Of all the diagnosis coding, this area was the most difficult, since many problems did not lend themselves to the disease classification system. Examples of these are (a) illiterate, (b) poor money management, (c) unreliable transportation, and (d) resource delay responding to need. However, expertise in this area was available within the study group, and the most appropriate ICD-9-CM choices were made. Diagnosis coding was reviewed by specialists in many areas, and their input was used to produce the final codes.

The percentage of diagnoses and procedures requiring recoding varied among specialties. For example, all procedures listed on the Neurology Clinic form were bonafide CPT codes, whereas all procedures listed on the Nutritional Clinic form were

extended codes not found in CPT, since CPT (as mentioned earlier) is designed for physician services.

Many very specific procedures, and frequently minor ones, with no corresponding CPT codes were recoded to general services codes (minimal, brief, extended service, etc.) This occurred more frequently with the primary care and non-surgical specialties because of the nature of the CPT system. The CPT system contains more codes for surgical procedures thus allowing for greater specificity in that area.

Twenty-one of the 50 most commonly used procedures required coding to general services. The assigned level of service generally corresponded to the estimated amount of time required to perform the indicated procedure (less than 15 minutes was minimal, 15 to 30 minutes was counted as brief, etc.) Supplies and other resources consumed also received consideration during the assignment to general service procedures.

Many ACDB visits contain multiple procedures. Since a number of procedures designated on the data collection forms were recoded to general services, some visits appeared to be a combination of two or more general services (such as a minimal service visit plus a brief service visit). If two codes were mapped to the same code, duplicates were eliminated. Appendices A and B contain code conversions for procedures and diagnoses respectively.

Another problem arising over coding conventions used on the data collection forms centered around the ICD-9-CM diagnosis code V655, described as "Person with feared complaint in which no diagnosis was made." This code was listed on the forms as "No Problem Noted" and was available for use by all health care providers involved in the data collection effort. Since over eight percent of visits in the data base contained this diagnosis, a careful analysis by clinic was done. A good number of the V655 diagnoses were for various types of physical exams, including eye exams. To provide more precision in visits where V655 was used, several corrective steps were taken. If a meaningful secondary diagnosis had been provided, then that diagnosis was used. If no secondary diagnosis had been provided, then other V codes with a higher degree of specificity were selected by the research physician on the team. A list of the more specific diagnosis codes by clinic are provided in Appendix D.

Special Coding Considerations

In order to use pertinent ancillary services data (i.e., number and type of x-rays, number of prescriptions, number of laboratory tests) captured on the front of the data collection form, information had to be translated into a coding format. For example, the Ordered Out of Clinic box contained information on

specific types of x-rays like CT Scan and MR Scan. However, no CPT code was used to designate which type of CT Scan or MR Scan was used. The study team physician reviewed the data to determine the most appropriate codes in each case. In some clinics, there was a possibility that a particular radiological procedure might have been marked on both the front and back of the form. In order to avoid double counting of radiological procedures, the algorithm contained in Table 2 was developed. Table 2 contains a list of the radiological and other special procedures with their assigned CPT codes.

Some of the information from the front of the form was converted into a CPT procedure code. If by converting this information, the number of procedures exceeded 13, the additional procedure was dropped. Since there were so few cases that exceeded 13, it was not considered to be a problem.

TABLE 2 Radiological and Other Special Procedures

PROCEDURE	CPT CODE
Barium Study	74270
IVP	74400 (If 74415 was marked on the back of the form, then 74415 was used instead of 74400).
CT Scan	70470 (If 71250 was marked on the back of the form, then 71250 was used instead).
MR Scan	70550
Ultrasound	76700 (If a code fell within the range of 76500-76999 and was marked on the back of the form, then that code was used instead).
Nuclear Medicine	78801 (If a code fell within the range of 78000-79999 and was marked on the back of the form, then that code was used instead).
Angiographic	75501
Adaptive Appliance	99070
EEG	95819 (If a code fell within the range of 95819-95823 and was marked on the back of the form, then that code was used instead).
Pulmonary	94010
EMG	95860 (If a code was within the range of 95860-95869 and was marked on the back of the form, then that code was used).

COST METHODOLOGY

In order to accurately evaluate the various ambulatory classification systems, the development of an equitable per visit cost was necessary. This presented a significant challenge in that it required a comprehensive individual cost for each patient encounter (visit) in the ACDB data file.

The study team developed four different methods to approximate a visit cost. The development of the various methodologies was necessary because military hospitals do not use a civilian type cost methodology that is capable of producing a "cost" or more precisely a "bill" for each individual visit.

Military hospitals are funded from various funding sources. For example, military pay and allowances are paid from a general fund account and may be regarded as "sunk" costs in that they are paid to military health care providers regardless of the number of patients to whom they provide care. Civilian health care provider salaries and benefits are resourced from major command allocation of funds, balanced with authorized personnel ceilings. The medical treatment facility commanders, once given their allocations of personnel, have nominal authority to manage personnel and associated cost. Normal capital expenses, new buildings and equipment, are provided subject to availability of funds, from major commands or higher command levels and are not included in the hospitals's operating budget.

Utilities are considered installation operating expenses and, as such, are not included in the hospital's operating budget. However, it should be mentioned that such installation expenses are captured in the Medical Expense Performance Report System (MEPRS) at the medical facility level. This and other expense data elements, as products of the MEPRS system will play a significant role in ambulatory care resourcing. Finally, it was not possible for the study team to develop cost methodologies associated with indirect health care cost (i.e., provider malpractice insurance, forms, or other such indirect costs). Nevertheless, as the military adapts to new ambulatory costing and resource allocation methodologies, all inclusive expense data is vital to insure fair and equitable medical treatment facility funding.

Definitions of Cost Formula Components

A description of the various components that make up the cost formulas follows:

ANCILLARY: For those laboratory procedures indicated by CPT procedure codes within the range of 80002 - 89399, a percentage of the Civilian Health and Medical Program for the Uniformed

Services (CHAMPUS) rate was used. The following steps were taken to calculate this percentage. A military average for laboratory was calculated (total number of visits in the sample, 516,006 sample, 516,006 multiplied by the average per visit MEPRS laboratory reimbursement of $3.36). This total was divided by the actual number of laboratory procedures performed (152,982) to provide an average cost per procedure of $11.33. The average for all CHAMPUS laboratory procedures was $18.25. The percentage of military to CHAMPUS ($11.33/$18.25) was 62.1%. This percentage was applied to laboratory procedures indicated on the back of the data collection form.

CHAMPUS: These rates are based on the CHAMPUS prevailing rate for each CPT procedure. The CHAMPUS prevailing rates (the amount of money paid) for a total number of claims for a particular state. The claim(s) are paid at the 80th percentile as the prevailing rate for the procedure in that state. The CHAMPUS prevailing rates in this study were the average of the regional rates at the time of the data collection. Additionally, the CHAMPUS prevailing rate, and a professional component accounting for the remaining 40%. (CHAMPUS Fiscal Intermediary Pricing File Extract Report for Fiscal Year 1988, August 1988).

CLMEAN: An average procedure cost per clinic group was employed for calculating a military supply cost. This average was computed by taking the sum of all CHAMPUS procedure costs for a clinic grouping divided by the number of visits in that particular grouping.

FACCOMP: The facility component is obtained by using the following formula: AVERAGE PROCEDURE COST PER MINUTE MULTIPLIED BY PRIMARY PROVIDER TIME. The average procedure cost (AVGPROC COST) is 60% (60% represents the technical component of the CHAMPUS fee) of the sum of the procedure costs for all visits within a clinic grouping divided by the sum of the providers' time for all visits within a clinic grouping.

LAB: The number of laboratory procedures ordered during a visit was indicated on the front of the data collection form. This number was then multiplied by a computed average cost. The average cost for laboratory was calculated by multiplying the total number of visits in the sample 516,006 by the military (MEPRS) average reimbursement per visit of $3.36. This total was divided by the actual number of procedures performed (152,982) in the sample to provide an average cost of $11.33 (see Table 8).

LABOR: The labor cost component used in the form consisted of a combination of salary and benefits for military, and salary only for civilians. It is determined by minutes of contact time with patients. The military labor costs were derived from the Composite Standard Rates for Costing Personnel Services-Military. These composite standard rates for each grade

are published annually by Department of the Army, Director of Finance and Accounting, Security Assistance and Cost and Property Accounting Division, Indianapolis, Indiana. Since data were collected across two fiscal years, the appropriate rate for each of the study years was used to determine labor costs. The published annual cost (salary and benefits exclusive of medical incentives) for each military pay grade was divided by 2,080 (duty hours per year) to derive a basic hourly rate. This hourly rate was then divided by 60 to obtain a rate/minute scale required by this study. The Civilian Health Care Provider Composite Standard Cost Rates were derived from the General Schedule Salary Tables No. 70 (FY85), No. 71 (FY86), and No. 72 (FY87). These tables are published by the Office of Personnel Management, Assistant Director for Pay and Benefits, Washington, D.C. For purposes of the study, the median step level of five was used within each grade. The annual salary was then divided by 2,087 hours (number of civilian productive hours in a calendar year was then divided by 60 to obtain a rate/per minute scale.

RX: An average cost per prescription ordered was calculated based on the available MEPRS data. The MEPRS cost is spread over all visits without taking into consideration whether a prescription was actually ordered for a particular visit. In order to use the more specific visit services which were contained in the ACDB, it was necessary to compute an average cost per prescription and multiply this by the number of prescriptions ordered for a particular visit. The computations for obtaining the average cost uses the MEPRS average rate per visit ($5.43) multiplied by the total number of visits (516,006). The result was the total reimbursement ($2,801,912.00). This total rate was divided by the actual number of prescriptions (264,070) filled to determine average cost per unit ($10.61) (see Table 8).

X-RAY: The charge for this service was obtained by using 39% of the CHAMPUS rate for those procedures contained n the CPT code range of 70002-79999. Since x-ray procedures have such a wide range of costs ($27.30 for a plain film to $661.00 for a CT Scan), it was decided that a percentage rather than the flat military (MEPRS) rate would be more appropriate. The total reimbursement was calculated by multiplying the number of visits (516,006) in the sample by the average reimbursement of ($1,284.85.00). This was divided by the number of plain films (55,308) for an average military reimbursement of $23.23 per plain film. This ratio ($23.23/$59.52) of military to CHAMPUS was 39%. This percentage was applied to all radiological procedures including high technology procedures like MRI, CT Scan, etc.

TABLE 3 Basis for Laboratory and Prescription Average Costs

	TOTAL VISITS	COST PER VISIT	TOTAL COST	N OF PROC	PER UNIT
LAB	516,006	$3.36	$1,733,780.00	152,982	$11.33
RX	516,006	$5.43	$2,801,912.00	264,070	$10.61

Other Special Cost Considerations

The inclusion of X-ray costs in the study formulas presented a special challenge to the study group as only the number and the general types of x-rays were included in the data collection instrument (i.e., plain films, CT scan). To capture the cost of this important aspect of medical care, a staff physician assigned a CPT x-ray procedure code to each clinic. The decision to assign a particular code to a clinic was based on the most common type of x-ray for that clinic.

Some of the CPT procedure codes used in the study had no corresponding CHAMPUS costs. In order to use these codes, the physician assigned to the team selected a related CPT code to substitute for costing purposes.

The pain clinic presented another situation which required special treatment. Because of the specificity of the data collection form, duplication of documentation for injections sometimes occurred. To correct this double counting, an algorithm was written which grouped certain CPT procedures together and assigned a cost based on the more expensive procedure.

Summary of Cost Methodology

In summary, the ACES Study team developed various cost methodologies using a variety of sources (e.g., MEPRS, CHAMPUS) to calculate resource utilization for each military health care visit. These cost equations allowed the investigation of various cost concepts using the combined strength of the ACDB data and in some equations, the CHAMPUS prevailing rates. In addition, the MEPRS cost data with its fundamental limitations was used. The development of each equation was an effort to investigate the various cost combinations and variations in those costs with respect to clinic visits in a military health care setting. Because of the limitations of the military cost expense system, the ACES team chose to incorporate the CHAMPUS prevailing rates into a "proxy cost" for cost consideration.

A brief description of the four cost methodologies follows. The first formula uses primarily military costs, the second,

civilian. The two remaining formulas only address partial costs. COST3 is military labor only and COST4 contains reimbursable costs in the current military system.

COST FORMULAS

A brief explanation of each costing methodology follows:

COST1 = ***FACCOMP*** + ***X-RAY*** + ***LAB*** + ***RX*** + ***LABOR***.

This equation is a combination of actual and computed military costs. This formula contains as complete a military visit cost as possible to compute given the presently available data.

COST2 = ***CHAMPUS PROCEDURE RATE***.

CHAMPUS procedure rate using a minimum rate based on time (100% of CHAMPUS rate for x-ray and laboratory procedures included). This cost formula uses only CHAMPUS rates for costs. The rationale for using only civilian costs (i.e., CHAMPUS) pertains to the aforementioned fact that the system being evaluated is a civilian reimbursement classification system. Also, the CHAMPUS procedure formula provides a cleaner cost model since it is not a mixture of military and civilian costs. However, one disadvantage of using CHAMPUS costs is that they are derived from charges not actual costs. This formula establishes a minimum value for each visit based on the CHAMPUS procedure costs for Office Medical Services. This costing methodology takes into account the fact that in 42% of ACDB visits no procedures were coded. In a civilian community, any visit would contain at least one of the types of services listed in the CPT classification of Office Medical Services. The Office Medical Services codes allowed for coding of visits which were primarily office visits without a procedure listed elsewhere in CPT. If a visit contained no other procedures, then a basic office visit code was assigned based on the amount of time spent with a patient. The following is a breakdown of the time intervals used to determine each type of Office Medical Service code:

1 - 15 minutes used CPT-4 code 90000 Brief Service.
16 - 30 minutes used CPT-4 code 90015 Intermediate Service.
Over 30 minutes used CPT-4 code 90020 Comprehensive Service.

COST3 = ***Labor only.***

This costing methodology looks only at the cost of provider time for a visit. The relationship of health care provider time and its corresponding cost are of vital concern to both military and civilian health care facilities. This formula provides an advantage over using time only because it accounts for the fact that a given quantity of time does not carry the same cost for all health care providers. That is, 30 minutes of a neurosurgeon's time costs considerably more than 30 minutes of a physical therapy technician's time. Unfortunately, the various bonuses given to the different physician specialties were not included in the formula.

COST4 = ***(.055 multiplied by CLEMAN) + X-RAY + ANCILLARY + LAB + RX.***

COST4 represents the sum of reimbursable costs as they currently exist in the Army Medical Department. It includes a computed military supply cost. The 5.5 percent of the CLEMAN represents this computed supply cost. This percentage was derived with the assistance of Herb Filmore, New York State Department of Public Health. Moreover, it should be noted that the 5.5 percent military supply cost compares favorably with the supply cost developed and utilized for reimbursement by the New York State Department of Health. Since it is based on an average procedure cost for a particular clinic grouping, some differentiation in supply cost occurs.

Correlation Among Cost Methodologies

There are a number of methods available to determine the relationship among cost methodologies. However, the most meaningful examines the amount of variance accounted for by each of the cost equations. The relationship among the cost methodologies is provided in Table 3. COST1 and COST3 are highly correlated (.8) in part because of the fact that COST1 includes COST3. COST1 and COST4 are highly correlated (.5) as there is overlap in that both include x-ray, prescription, and ancillary costs. The CHAMPUS (civilian) data is less highly correlated with the military based costs. COST3 and COST4 are not correlated. There is no overlap and a link is not really expected between labor cost and supply cost since many procedures require no supplies (e.g., psychotherapy). It is important to note that while all the correlation's are statistically significant ($p<.05$), this maybe due primarily to the large sample (516,006) size.

TABLE 4 Relationship Among Cost Methodologies Correlation Coefficient

(N = 516,006)

COST	1	2	3	4
1	1.000			
2	0.3959	1.000		
3	0.8024	0.3376	1.000	
4	0.5360	0.2310	0.1286	1.000

p<.05 in all cases.

Emergency Department Patient Demographics

A review of the number of patients by different age groups confirms that the military health care system serves a diverse population similar to civilian community hospital populations. Young adults (21-29) compromise 22.67% of the ED patients: 46.61% of those are female, 53.39% are male. The high proportion of females and diversity of patient ages clearly indicates that the military health care system supports the "total" military family. Family member patients, male and female, are the largest patient category with 41.57%, compared to 25.09% for military active duty patients. The category "Other" patients, is third largest with 22.55%. The "Other" patient category contains patients that are (a) not members of the military, but eligible to receive care in military facilities; (b) civilian emergencies; and (c) those whose military status could not be verified. Additional demographic information on the Emergency Department Sample is contained in Table 5.

TABLE 5 Demographic Characteristics of Emergency Department Sample by Number, Percent of Patient Visits and Beneficiary Status

GENDER BY AGE GROUP	PATIENTS VISITS		INDIVIDUAL PATIENTS	
	NUMBER	PERCENT	NUMBER	PERCENT
SEX:				
Female	10824	47.66	9442	47.03
Male	11885	52.34	10635	52.97
TOTAL	22709	100.00	20077	100.00

AGE:				
0-2	1799	7.92	1579	7.86
3-11	2728	12.01	2426	12.08
12-20	4867	21.01	4384	21.84
21-29	5149	22.67	4581	22.82
30-38	2517	11.08	2210	11.01
39-47	1877	8.27	1648	8.21
48-56	1728	7.61	1507	7.51
57-65	1290	5.68	1072	5.34
66 and older	754	3.32	670	3.34
TOTAL	22709	100.00	20077	100.00
BENEFICIARY STATUS:				
Military Active Duty	5698	25.09	5297	26.38
Family Member	9440	41.57	8207	40.88
Other	5121	22.55	2490	12.40
Unknown	2450	10.79	4083	20.34
TOTAL	22709	100.00	20077	100.00

EDG Grouper Results

The EDG grouper program assigned 99.9% (22,684) of the 22,709 visits in the ED sample. Table 6 presents the frequency of assigned visits to the EDGs in descending order. Twenty-five (0.1%) of the visits in the ED sample did not group due to one of three types of errors (a) invalid principle diagnosis--for 19 of the (76%) of the non-grouping visits, (b) invalid diagnosis for an ED for 2 (8%) of the visits, and (c) principle diagnosis inconsistent with other variables--for 4 (16%) of the visits. These ungrouped records were not corrected nor re-run through the grouper.

TABLE 6 Number and Percent of Visits in Emergency Departments Data Assigned to Each EDG

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
1	077	Upper Respiratory Infection, Age <65	3633	16.0	16.0

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
2	025	Sprains, except Neck w/o Other Injury	1399	6.2	22.2
3	164	Psychiatric Disorders, age <36	1242	5.5	27.7
4	021	Open Wounds, except Hands & Feet, w/o Other Injury	1194	5.3	32.9
5	190	Joint Disease, Age <65	956	4.2	37.1
6	182	Otitis Media	879	3.9	41.0
7	029	Contusions, except Fingers & Toes, w/o Other Injury	797	3.5	44.5
8	120	Other Gastrointestinal Disorders, Age <36	790	3.5	48.0
9	189	Non-Infective Dermatological Disorders	700	3.1	51.1
10	080	Lower Respiratory Disorders, Age <65	563	2.5	53.6
11	188	Skin & Subcutaneous Infections	496	2.2	55.8
12	158	Headache	484	2.1	57.9
13	200	Administrative & Other Well-Patient Visits	479	2.1	60.0
14	112	Gastroenteritis, Age <36	417	1.8	61.8
15	133	Urinary Tract Infections, Age <65	381	1.7	63.5
16	009	Other Fractures & Dislocations w/o Other Injury	371	1.6	65.2
17	032	Abrasions	345	1.5	66.7
18	199	Follow-Up & Aftercare	342	1.5	68.2
19	165	Psychiatric Disorders, Age 36-65	328	1.4	69.6
20	019	Open Wounds w/o Other Injury, w/ Simple Procedure	311	1.4	71.0
21	083	Asthma, Age <36	225	1.0	72.0
22	143	Vaginal, Vulvar & Menstrual Disorders	218	1.0	73.0
23	192	Spinal Disease, Age <36	218	1.0	73.9
24	030	Burns	217	1.0	74.9
25	180	Conjunctivitis	214	0.9	75.8
26	079	Sinus Disorders	209	0.9	76.7
27	038	Other Injuries	206	0.9	77.6
28	075	Chest Pain, Age 36 or Older	193	0.9	78.5
29	204	Allergic Reaction	184	0.8	79.3
30	183	Otitis Externa	173	0.8	80.1
31	207	Unspecified & Ill-Defined, Age <36	171	0.8	80.8
32	121	Other Gastrointestinal Disorders, Age 36 or Older	167	0.7	81.6

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
33	004	Fracture/Dislocation of Fingers & Toes	145	0.6	82.2
34	193	Spinal Disease, Age 36 or Older	145	0.6	82.8
35	208	Unspecified & Ill-Defined, Age 36 or Older	141	0.6	83.5
36	031	Insect Bites (Non-Poisonous)	120	0.5	84.0
37	105	Other Respiratory Disorders	117	0.5	84.5
38	108	Esophagus & Stomach Disorders	113	0.5	85.0
39	074	Chest Pains, Age <36	111	0.5	85.5
40	113	Gastroenteritis, Age 36 or Older	110	0.5	86.0
41	082	Chronic Obstructive Pulmonary Disorders	100	0.4	86.4
42	106	Oral Disorders	97	0.4	86.8
43	084	Asthma, Age 36 or Older	87	0.4	87.2
44	033	Foreign Body of Eye, Ear & Nose	80	0.4	87.6
45	086	Other Respiratory Disorders	80	0.4	87.9
46	110	Esophagus & Stomach Disorders	76	0.3	88.3
47	137	Male Genital Disorders	76	0.3	88.6
48	039	Poisonings, Drug	72	0.3	88.9
49	023	Sprain Neck w/o Other Injury	68	0.3	89.2
50	117	Rectal Disorders	67	0.3	89.5
51	160	Vertigo, Age <65	66	0.3	89.8
52	147	Other Obstetric/Gynecological Disorders	65	0.3	90.1
53	191	Joint Disease, Age 65 or Older	64	0.3	90.4
54	067	Hypertension, Age <65	60	0.3	90.6
55	146	Complications of Pregnancy	59	0.3	90.9
56	095	Angina & Chest Pain	58	0.3	91.2
57	114	Constipation	56	0.2	91.4
58	181	Other Eye Disorders	55	0.2	91.7
59	159	Syncope & Collapse	53	0.2	91.9
60	162	Other Neurologic Disorders	50	0.2	92.1
61	205	Minor Systemic Infectious Diseases	49	0.2	92.3
62	136	Gonococcal & Non-Gonococcal Urethritis	47	0.2	92.5
63	203	Metabolic & Endocrine Disorders	47	0.2	92.7
64	166	Psychiatric Disorders, Age 65 or Older	44	0.2	92.9
65	179	Eyelid Disorders	44	0.2	93.1
66	132	Urinary Tract Infection, Age <65 w/o Disorder	43	0.2	93.3
67	135	Urinary Calculus	42	0.2	93.5

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
68	185	Epistaxis	41	0.2	93.7
69	011	Head Injury w/ Concussion or Fracture	39	0.2	93.9
70	119	Hernia	39	0.2	94.0
71	163	Alcohol & Drug Dependence	39	0.2	94.2
72	184	Other Ear Disorders	39	0.2	94.4
73	015	Open Wounds w/ Other Injury w/ Simple Procedure	38	0.2	94.5
74	028	Contusions, except Fingers & Toes	38	0.2	94.7
75	076	Other Circulatory System Disorders	37	0.2	94.9
76	002	Shoulder Dislocation	35	0.2	95.0
77	017	Open Wounds, except Ha... & Feet	35	0.2	95.2
78	078	Upper Respiratory Infection, Age 65 or Older	35	0.2	95.3
79	024	Sprains, except Neck, w/ Other Injury	34	0.1	95.5
80	177	Psychiatric Disorders, Age <36	33	0.1	95.6
81	142	Pelvic Inflammatory Disease	32	0.1	95.8
82	101	Lower Respiratory Disease, Age <65	31	0.1	95.9
83	197	Skin Disorders	31	0.1	96.0
84	013	Head Injury w/o Concussion or Fracture	30	0.1	96.2
85	071	Dysrhythmia & Conductive Disorders, Age 36-65	30	0.1	96.3
86	131	Other Gastrointestinal Disorders	30	0.1	96.4
87	040	Poisonings, Non-Drug	29	0.1	96.6
88	111	Intestinal Obstruction & Diverticulitis	28	0.1	96.7
89	141	Genitourinary Disorders	28	0.1	96.8
90	201	Blood & Blood Forming Organ Disease	27	0.1	96.9
91	062	Other Injuries	25	0.1	97.0
92	056	Fracture w/o Other Injury	24	0.1	97.1
93	081	Lower Respiratory Disease, Age 65 or Older	23	0.1	97.2
94	127	Gastroenteritis	22	0.1	97.3
95	202	Metabolic & Endocrine Disorders, Age <36	22	0.1	97.4
96	145	Breast Disorders	21	0.1	97.5
97	134	Urinary Tract Infection, Age 65 or Older	19	0.1	97.6
98	006	Fracture/Dislocation of Nose w/o Other Injury	18	0.1	97.7
99	151	Gynecological Disorders	18	0.1	97.8
100	034	Foreign Body, except Eye, Ear & Nose	17	0.1	97.8
101	129	Appendicitis	17	0.1	97.9

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
102	161	Vertigo, Age 65 or Older	17	0.1	98.0
103	096	Dysrhythmia & Conductive Disorder	16	0.1	98.1
104	103	Asthma, Age <36	16	0.1	98.1
105	130	Gastrointestinal Hemorrhage	16	0.1	98.2
106	156	Convulsions, Age <36 w/o Other Disorder	16	0.1	98.3
107	107	Esophagus & Stomach Disorders, Age <36	15	0.1	98.3
108	116	Liver/Gallbladder/Pancreas Disorders	14	0.1	98.4
109	178	Psychiatric Disorders, Age 36 Or Older	14	0.1	98.5
110	109	Esophagus & Stomach Disorders, Age 36 or Older	13	0.1	98.5
111	003	Fracture/Dislocation of Fingers & Toes	12	0.1	98.6
112	070	Dysrhythmia & Conductive Disorders, Age <36	12	0.1	98.6
113	093	Acute Myocardial Infarction, Age <65	12	0.1	98.7
114	115	Liver/Gallbladder/Pancreas Disorders <36	12	0.1	98.7
115	126	Liver/Gallbladder/Pancreas Disorders	12	0.1	98.8
116	150	Obstetrics Disorders	12	0.1	98.8
117	176	Other Neurologic Disorders	12	0.1	98.9
118	008	Other Fractures & Dislocations w/ Single Other Injury	11	0.0	98.9
119	069	Angina	11	0.0	99.0
120	073	Heart Failure (Stable)	11	0.0	99.0
121	104	Asthma, Age 36 or Older	11	0.0	99.1
122	157	Convulsions, Age 36 or Older	11	0.0	99.1
123	063	Poisonings, Drug	10	0.0	99.2
124	065	Death, except Trauma	10	0.0	99.2
125	097	Congestive Heart Failure	10	0.0	99.3
126	154	Cerebrovascular Disease	10	0.0	99.3
127	187	Eye, Ear & Nose Disorders	10	0.0	99.4
128	198	Musculoskeletal Disorders	10	0.0	99.4
129	216	Unspecified & Ill-Defined Disorders	10	0.0	99.4
130	072	Dysrhythmia & Conductive Disorders	9	0.0	99.5
131	057	Head Injuries	8	0.0	99.5
132	068	Hypertension, Age 65 or Older	8	0.0	99.6
133	128	Intestinal Obstruction & Diverticulitis	8	0.0	99.6
134	173	Cerebrovascular Disease	8	0.0	99.6

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
135	212	Blood & Blood Forming Organ Disease	8	0.0	99.7
136	060	Open Wounds w/o Other Injury	7	0.0	99.7
137	022	Sprain Neck w/ Other Injury	6	0.0	99.7
138	094	Acute Myocardial Infarction, Age 65 or Older	6	0.0	99.7
139	010	Head Injury w/ Concussion or Fracture	5	0.0	99.8
140	061	Burns	5	0.0	99.8
141	213	Metabolic & Endocrine Disorders	5	0.0	99.8
142	100	Chronic Obstructive Pulmonary Disease	4	0.0	99.8
143	174	Convulsions	4	0.0	99.9
144	098	Other Circulatory System Disorders	3	0.0	99.9
145	102	Lower Respiratory Disease, Age 65 or Older	3	0.0	99.9
146	118	Appendicitis	3	0.0	99.9
147	175	Syncope & Collapse	3	0.0	99.9
148	206	Certain Serious Infectious Diseases	3	0.0	99.9
149	214	Minor Systemic Infectious Diseases	3	0.0	99.9
150	001	Trauma & Poisoning Death	2	0.0	99.9
151	005	Fracture/Dislocation of Nose w/ Other Injury	2	0.0	99.9
152	090	Cardiopulmonary Disorders w/ Critical Care Procedure	2	0.0	99.9
153	148	Newborn Disorders	2	0.0	99.9
154	055	Fracture w/ Other Injury	1	0.0	99.9
155	058	Internal Injuries	1	0.0	99.9
156	064	Poisonings, Non-Drug	1	0.0	99.9
157	099	Pulmonary Edema	1	0.0	99.9
158	139	Other Genitourinary Disorders	1	0.0	99.9
159	155	Convulsions, Age <36 w/ Other Disorder	1	0.0	99.9
160	194	Bone Disease	1	0.0	99.9
161	211	Miscellaneous Disorders	1	0.0	100.0
161	TOTAL		22684	100.00	100.00

Review of Table 6 reveals that of the 216 groups comprising the EDGs only 161 or 75% of the groups were utilized. In order to understand the reason why the remaining 55 EDGs were not utilized, a clinical analysis was conducted. The results of this analysis indicated that 30 EDGs were not filled because these EDGS require transfer information which was not available. EDGs 36 and 37 involving rape as a diagnosis may not have been utilized probably due to Army regulations concerning

confidentiality. EDG 37 (Home, Observation Following Accident or Injury) was not used perhaps because of the need for specific prior EDG coding knowledge. No specific explanations are offered for the remaining 22 EDGs that were not utilized. However it did seem unusual that EDG 54, Admits, Penetrating Trauma (gunshot or stab wound) was not utilized despite one of the EDs in the sample being part of a Level 1 trauma center which routinely receives such patients. In order to gain a better understanding of the frequency of the EDG visits, an additional analysis was conducted to construct a frequency distribution of the range of visits by EDGs. The results of this analysis are contained in Table 7.

TABLE 7 Emergency Department Data (Range of Visits by EDGs)

Number of Visits Assigned to an Individual EDG (Ranges)	EDGs in Ranges		Number of Visits in Ranges	
	Number	Percent	Number	Percent
0	55	25.46	0	0
1-29	74	34.26	808	3.56
30-100	47	21.76	2372	10.46
101-1000	36	16.67	1203	53.06
1001 or more	4	1.85	7468	32.92
TOTAL	216	100.00	22684	100.00

Table 7 shows the EDG grouper assigned no patient visits to 55 or 25.46% of the EDGs. Seventy-four or 34.36% of the other groups only had between 1 and 29 visits. Only 4 or 1.85% contained more than 1000 visits. One hundred seventy six or 81%, i.e. the majority, of the EDGs had 100 or less visits assigned to their group.

Analysis Using Costs

The four costing methodologies discussed earlier were applied to the EDGs to allow analyses on the effectiveness of the grouper as a resource allocator.

The analysis of variance is the statistical technique which has been by most grouper developers and evaluators to test the hypothesis that the grouper creates within group homogeneity and intergroup heterogeneity. Applying an analysis of variance to this kind of data requires care in interpreting the results. The assumptions underlying the use of parametric statistical methods

are (a) the observations are normally distributed in the population, (b) that variances of populations are the same, (c) observations in the sample have been randomly drawn, and (d) the data used are scaled on an interval or ratio scale of measurement. Using real world data it is extremely difficult to satisfy all the assumptions for using parametric statistics and a violation of assumptions per se is an insufficient reason to reject a parametric statistic. Moreover, in reality with data collected on an interval or ratio scale there are few alternatives. To create a more normal distribution the developers of the EDGs trimmed the data at three standard deviations from the mean, thus approximating a normal distribution. Trimming is an accepted and standard practice among grouper developers some of whom employ more liberal trimming policies (i.e., trimming at 2 standard deviations from the mean). Another method to normalize the distribution is to transform a variable under study and utilize its logarithm instead of its original (arithmetic) value.

In order to evaluate the data and the grouper in the most objective manner a series of analyses was conducted. The first series utilized techniques for testing the normality of the distribution (i.e., how much did the data differ from a normal distribution). Table 8 demonstrates that the ED sample is significantly skewed using the four cost formulas. This skewness can be reduced if a logarithmic transformation of the data is performed. The logarithmic transformation normalizes a distribution by reducing the effect of outliers. This is especially important in terms of evaluating classification systems since there will be a limit placed on the extent of outliers. This procedure was repeated with Sample 1 as indicated in Table 8.

TABLE 8 Characteristics of Sample 1 Cost Distributions

COST ALGORITHM	SKEWNESS	KURTOSIS
COST 1	4.9290	42.5020
LOG COST 1	0.1087	0.5560
COST 2	6.4926	103.5120
LOG COST 2	1.0512	0.9569
COST 3	5.6866	64.0971
LOG COST 3	-0.1218	0.5878
COST 4	34.5856	35.5856
LOG COST 4	0.7004	-0.3818

The ED sample was then grouped using the EDG grouper. Table 9 demonstrates the amount of skewness and kurtosis before and after logarithmic transformation of the cost variables. As is readily seen, logarithmic transformation of the cost variables enables a closer approximation to the normality assumption.

TABLE 9 Characteristics of ED Sample Cost Distribution After EDG Groupings

(86 groups, EDG with> 30)

COST ALGORITHM	MEAN SKEWNESS	MEAN KURTOSIS
COST 1	2.2314	8.5680
LOGCOST 1	0.2734	-0.0018
COST 2	3.7822	30.5239
LOGCOST 2	0.91880	1.6192
COST 3	2.6748	10.7066
LOGCOST 3	0.6295	0.3913
COST 4	1.5507	3.9437
LOGCOST 4	0.2823	-0.7281

To evaluate the soundness of the groups created by the EDG grouper a one-way analysis of variance (ANOVA) was performed. A one-way ANOVA is a nonparametric procedure designed to test the means (differences) of two or more groups. Recognizing that it may be more appropriate to utilize a general linear model (GLM) when analyzing unbalanced data (unequal number of cases in each group) the study team utilized both procedures. This proved to be an enlightening experience as both the ANOVA and GLM of the Statistical Analysis System (SAS) provided the same results. Prior to performing the analyses the 55 EDG groups for which there were no visits were excluded as were the 74 EDG groups for which there were less than 30 visits. The decision to exclude EDG groups with less than 30 visits was based on the central limit the orem which states that distributions (sample size) less than 30 will not approximate a normal distribution. As shown in Table 10 the amount of variance accounted for (r-square) by the cost models varied depending on the cost methodology and whether or not a logarithmic transformation was performed. The grouper appears most effective (accounting for the most Variance) when using LOGCOST1 (complete military cost) and LOGCOST4 (reimbursable military supply costs) and least effective using LOGCOST3 (labor cost only).

TABLE 10 Results of General Linear Models Emergency Department Sample Cost Methodologies and Logarithm Transformations

COST VARIABLE	R-SQUARE	COEFFICIENT OF VARIATION
COST1	0.1042	98.7670
LOGCOST1	0.1443	19.8364
COST2	0.0693	87.3889
LOGCOST2	0.1247	12.0337
COST3	0.0684	116.4857
LOGCOST3	0.0959	35.5926
COST4	0.1441	89.7155
LOGCOST4	0.1443	31.3348

Table 10 demonstrates that the use of LOGCOSTS improved the amount of variance explained by a modest amount and the smaller coefficient of variation indicates a substantial decrease in the dispersion in comparison to the mean.

The next analysis consisted of trimming the data to 3 standard deviations on either side of the mean. This reduces the outliers (essentially those visits which contain cost that are unreasonable expensive or inexpensive) and is consistent with the methodology employed by the developers of the EDGs. Additionally, logarithm transformations of the data were performed to normalize the data. The results are similar to those obtained previously with the logarithm COST1 (complete military cost) accounting for most variance. For additional information on this analysis see Table 11.

TABLE 11 Results of General Linear Models Emergency Department Sample Cost Methodologies and Logarithm Transformations Data Trimmed at Three Standard Deviations From the Mean

COST VARIABLE	R-SQUARE	CV	# TRIMMED VISITED
COST1	0.1302	93.0820	107
LOGCOST1	0.1562	19.4438	107
COST2	0.1465	59.5124	202
LOGCOST2	0.1455	11.2344	202
COST3	0.1037	106.1478	199
LOGCOST3	0.1138	34.4157	199
COST4	0.1555	88.4166	62
LOGCOST4	0.1521	31.1295	62

To further reduce the influence of outliers and to enable the study team to compare the effectiveness of other groupers the data was trimmed to 2 standard deviations from the mean. GLMs were performed using cost and the logarithm transformation of costs. As the results of these analyses indicate (Table 12) the logarithm cost utilizing cost1 (complete military cost) continued to explain the most variance.

TABLE 12 Results of General Linear Models Emergency Department Sample Cost Methodologies and Logarithm Transformations Data Trimmed at Two Standard Deviations From the Mean

COST VARIABLE	R-SQUARE	CV	# TRIMMED VISITS
COST1	0.2193	78.5345	53
LOGCOST1	0.2146	17.3339	53
COST2	0.1868	48.0967	635
LOGCOST2	0.1568	10.3760	635
COST3	0.1888	88.3410	1,223
LOGCOST3	0.1138	34.4157	1,223
COST4	0.2145	83.1105	571
LOGCOST4	0.1958	29.9984	571

A comparative analysis of the GLM with the cost methodologies and trimming of the data at two and three standard deviations from the mean is contained in Table 13.

TABLE 13 Comparative Analysis Emergency Department Data General Linear Models with Cost Methodologies and Logarithmic Transformations, Untrimmed Data and Data Trimmed at Two and Three Standard Deviations from the Mean

COST VARIABLE	R-SQUARE	CV	# TRIMMED VISITS
COST1	0.1042	98.7670	0
COST1 (3 SD)	0.1302	93.0820	107
COST1 (2 SD)	0.2193	78.5345	53
LOGCOST1	0.1443	19.8364	0
LOGCOST1 (3 SD)	0.1562	19.4438	107
LOGCOST1 (2 SD)	0.2146	17.3339	53
COST2	0.0693	87.3889	0
COST2 (3 SD)	0.1465	59.5124	202
COST2 (2 SD)	0.1868	48.0967	635
LOGCOST2	0.1247	12.0337	0
LOGCOST2 (3 SD)	0.1455	11.2344	202
LOGCOST2 (2 SD)	0.1568	10.3760	635
COST3	0.0684	116.4857	0
COST3 (3 SD)	0.1037	106.1478	199
COST3 (2 SD)	0.1888	88.3410	1,223
LOGCOST3	0.0959	35.5926	0
LOGCOST3 (3 SD)	0.1138	34.4157	199
LOGCOST3 (2 SD)	0.1630	30.4580	1,223
COST4	0.1441	89.7155	0
COST4 (3 SD)	0.1555	88.4166	62
COST4 (2 SD)	0.2145	83.1105	571
LOGCOST4	0.1443	31.3348	0
LOGCOST4 (3 SD)	0.1521	31.1295	62
LOGCOST4 (2 SD)	0.1958	29.9984	571

Based on the results obtained using the ED data, the study group tested the hypothesis that a larger sample may allow the EDG grouper to assign visits to a greater number of EDGs, resulting in a more comprehensive evaluation of the EDG grouper. Additionally, if the larger sample contained non-ED visits, the

Health Systems Research, Inc. assumption that the grouping system could be utilized throughout a hospital could be examined. To test these assertions Sample 1, containing 516,006 visits, including the 22,709 ED visits was utilized. The methodology guiding the analyses in the ED sample was followed with Sample 1.

RESULTS USING SAMPLE 1 DATA

Demographic Characteristics of Sample 1

Of the 516,006 visits in the sample, 281,276 (54.51%) were by males and 234,730 (45.49%) were by females. The proportion of young adult (21 to 29 years old) patients in Sample 1 is 27.24%. This is larger than in the ED sample and possibly accounted for by the larger proportion of military active duty patients in Sample 1. Additional information on the gender and ages of the sample can be found in Table 14.

Table 14 Sample 1 Beneficiary Status by Individual Patients and Patient Visits

BENEFICIARY STATUS	PATIENT VISITS		INDIVIDUAL PATIENTS	
	NUMBER	PERCENT	NUMBER	PERCENT
SEX:				
Female	234730	45.49	99108	43.34
Male	281276	54.51	129574	56.66
TOTAL	516006	100.00	228682	100.00
AGE:				
0-2	28484	5.52	13073	5.72
3-11	38169	7.40	19818	8.67
12-20	108787	21.08	51932	22.71
21-29	145238	28.14	62286	27.24
30-38	66083	12.81	28158	12.31
39-47	37785	7.32	17157	7.50
48-56	34970	6.78	15554	6.80
57-65	32818	6.36	12674	5.54
66 and older	23672	4.59	8030	3.51
TOTAL	516006	100.00	228682	100.00

BENEFICIARY STATUS:				
Military Active Duty	196735	38.13	80587	35.24
Family Member	194993	31.97	71755	31.38
Retiree	48726	9.44	18540	8.11
Other	105552	20.46	57800	25.27
TOTAL	516006	100.00	228682	100.00

Results of EDG Grouper

The EDG grouper program assigned 98% (509,073) of the 516,006 visits in Sample 1. Table 15 presents the frequency of assigned visits to the EDGs in descending order. The 6,933 (1.34%) visits that did not group were due to one of three types of errors (a) invalid principle diagnosis, (b) invalid diagnosis for ED visit, or (c) principal diagnosis inconsistent with other variables. These are the same types of errors which were responsible for some visits not grouping in the ED sample.

TABLE 15 Number and Percent of Visits in Sample 1 Data Assigned to Each EDG

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
1	200	Administrative & Other Well-Patient Visits	70039	13.8	13.8
2	190	Joint Disease, Age <65	43460	8.5	22.3
3	077	Upper Respiratory Infection, Age <65	37404	7.3	29.6
4	189	Non-Infective Dermatological Disorders	30451	6.0	35.6
5	146	Complications of Pregnancy	22768	4.5	40.1
6	164	Psychiatric Disorders, Age <36	18859	3.7	43.8
7	025	Sprains, except Neck, w/o Other Injury	18303	3.6	47.4
8	181	Other Eye Disorders	18298	3.6	51.0
9	188	Skin & Subcutaneous Infections	13739	2.7	53.7
10	182	Otitis Media	12060	2.4	56.1
11	009	Other Fractures & Dislocations w/o Other Injury	11326	2.2	58.3
12	192	Spinal Disease, Age <36	9452	1.9	60.1
13	199	Follow-Up & Aftercare	8841	1.7	61.9
14	067	Hypertension, Age <65	8309	1.6	63.5
15	143	Vaginal, Vulvar & Menstrual Disorders	8291	1.6	65.1
16	165	Psychiatric Disorders, Age 36-65	8285	1.6	66.8
17	038	Other Injuries	6876	1.4	68.1
18	080	Lower Respiratory Disease, Age <65	6529	1.3	69.4
19	203	Metabolic & Endocrine Disorders	5877	1.2	70.6
20	137	Male Genital Disorders	5137	1.0	71.6
21	112	Gastroenteritis, Age <36	5078	1.0	72.6
22	162	Other Neurologic Disorders	5064	1.0	73.6
23	184	Other Ear Disorders	4748	0.9	74.5
24	193	Spinal Disease, Age 36 or Older	4660	0.9	75.4
25	158	Headache	4631	0.9	76.3
26	133	Urinary Tract Infection, Age <65	4539	0.9	77.2
27	204	Allergic Reaction	4186	0.8	78.0
28	147	Other Obstetric Gynecological Disorders	4177	0.8	78.8
29	076	Other Circulatory System Disorders	4091	0.8	79.7
30	079	Sinus Disorders	4088	0.8	80.5
31	207	Unspecified & Ill-Defined, Age <36	4037	0.8	81.2
32	021	Open Wounds, except Hands & Feet	3779	0.7	82.0
33	194	Bone Disease	3703	0.7	82.7

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
34	029	Contusions, except Fingers & Toes	3606	0.7	83.4
35	202	Metabolic & Endocrine Disorders	3557	0.7	84.1
36	136	Gonococcal & Non-Gonococcal Urethritis	3246	0.6	84.8
37	120	Other Gastrointestinal Disorders, Age <36	3048	0.6	85.4
38	180	Conjunctivitis	2927	0.6	85.9
39	145	Breast Disorders	2926	0.6	86.5
40	208	Unspecified & Ill-Defined, Age 36 or Older	2703	0.5	87.0
41	083	Asthma, Age <36	2630	0.5	87.6
42	139	Other Genitourinary Disorders	2487	0.5	88.0
43	183	Otitis Externa	2428	0.5	88.5
44	032	Abrasions	2219	0.4	89.0
45	068	Hypertension, Age 65 or Older	1981	0.4	89.3
46	117	Rectal Disorders	1973	0.4	89.7
47	201	Blood & Blood Forming Organ Disease	1971	0.4	90.1
48	108	Esophagus & Stomach Disorders, Age <36	1962	0.4	90.5
49	086	Other Respiratory Disorders	1819	0.4	90.9
50	082	Chronic Obstructive Pulmonary Disease	1807	0.4	91.2
51	166	Psychiatric Disorders, Age 65 or Older	1697	0.3	91.5
52	106	Oral Disorders	1667	0.3	91.9
53	191	Joint Disease, Age 65 or Older	1623	0.3	92.2
54	119	Hernia	1535	0.3	92.5
55	121	Other Gastrointestinal Disorders, Age 36 or Older	1531	0.3	92.8
56	205	Minor Systemic Infectious Diseases	1414	0.3	93.1
57	110	Esophagus & Stomach Disorders, Age 36 or Older	1274	0.3	93.3
58	004	Fracture/Dislocation of Fingers & Toes	1271	0.2	93.6
59	074	Chest Pain, Age <36	1233	0.2	93.8
60	030	Burns	1209	0.2	94.1
61	179	Eyelid Disorders	1099	0.2	94.3
62	163	Alcohol & Drug Dependence	989	0.2	94.5
63	111	Intestinal Obstruction & Diverticulitis	976	0.2	94.7
64	069	Angina	962	0.2	94.8
65	156	Convulsions, Age <36 w/o Other Disorder	943	0.2	95.0
66	160	Vertigo, Age <65	929	0.2	95.2
67	031	Insect Bites (Non-Poisonous)	905	0.2	95.4

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
68	075	Chest Pain, Age 36 or Older	895	0.2	95.6
69	154	Cerebrovascular Disease	824	0.2	95.7
70	084	Asthma, Age 36 or Older	817	0.2	95.9
71	132	Urinary Tract Infection, Age <65 w/ Other Disorder	761	.1	96.1
72	105	Other Respiratory Disorders	787	0.2	96.0
73	135	Urinary Calculus	753	0.1	96.3
74	019	Open Wounds w/o Other Injury	666	0.1	96.5
75	071	Dysrhythmia & Conductive Disorders, Age 36-65	639	0.1	96.6
76	024	Sprains, except Neck, w/ Other Injury	630	0.1	96.7
77	116	Liver/Gallbladder/Pancreas Disorders	600	0.1	96.8
78	113	Gastroenteritis, Age 36 or Older	598	0.1	97.0
79	002	Shoulder Dislocation	597	0.1	97.1
80	023	Sprain Neck w/o Other Injury	574	0.1	97.2
81	020	Open Wounds of Hands & Feet, w/o Other Injury	573	0.1	97.3
82	114	Constipation	553	0.1	97.4
83	008	Other Fractures & Dislocations w/ Single Other Injury	524	0.1	97.5
84	107	Esophagus & Stomach Disorders, Age <36	479	0.1	97.6
85	109	Esophagus & Stomach Disorders, Age 36 or Older	477	0.1	97.7
86	198	Musculoskeletal Disorders	470	0.1	97.8
87	115	Liver/Gallbladder/Pancreas Disorders, Age <36	464	0.1	97.9
88	185	Epistaxis	463	0.1	98.0
89	141	Genitourinary Disorders	447	0.1	98.1
90	142	Pelvic Inflammatory Disease	443	0.1	98.1
91	039	Poisonings, Drug	408	0.1	98.2
92	033	Foreign Body of Eye, Ear & Nose	382	0.1	98.3
93	131	Other Gastrointestinal Disorders	376	0.1	98.4
94	134	Urinary Tract Infection, Age 65 or Older	376	0.1	98.4
95	159	Syncope & Collapse	351	0.1	98.5
96	157	Convulsions, Age 36 or Older	349	0.1	98.6
97	150	Obstetrics Disorders	310	0.1	98.6
98	177	Psychiatric Disorders, age <36	305	0.1	98.7
99	040	Poisonings, Non-Drug	304	0.1	98.8

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
100	056	Fracture w/o Other Injury	304	0.1	98.8
101	078	Upper Respiratory Infection, Age 65 or Older	299	0.1	98.9
102	073	Heart Failure (Stable)	292	0.1	98.9
103	070	Dysrhythmia & Conductive Disorders, Age <36	278	0.0	99.0
104	151	Gynecological Disorders	253	0.0	99.0
105	081	Lower Respiratory Disease, Age 65 or Older	244	0.0	99.1
106	197	Skin Disorders	227	0.0	99.1
107	187	Eye, Ear & Nose Disorders	218	0.0	99.2
108	072	Dysrhythmia & Conductive Disorders, Age 65	208	0.0	99.2
109	155	Convulsions, Age <36 w/ Other Disorder	202	0.0	99.3
110	028	Contusions, except Fingers & Toes	189	0.0	99.3
111	011	Head Injury w/ Concussion or Fracture	176	0.0	99.3
112	118	Appendicitis	175	0.0	99.4
113	216	Unspecified & Ill-Defined Disorders	165	0.0	99.4
114	013	Head Injury w/o Concussion or Fracture	160	0.0	99.4
115	148	Newborn Disorders	154	0.0	99.5
116	138	Urethral Stricture	153	0.0	99.5
117	144	Ovarian Cyst	152	0.0	99.5
118	062	Other Injuries	139	0.0	99.6
119	176	Other Neurologic Disorders	137	0.0	99.6
120	017	Open Wounds, except Hands & Feet, w/ Other Injury	135	0.0	99.6
121	101	Lower Respiratory Disease, Age <65	132	0.0	99.6
122	006	Fracture/Dislocation of Nose w/o Other Injury	124	0.0	99.7
123	098	Other Circulatory System Disorders	112	0.0	99.7
124	161	Vertigo, Age 65 or Older	104	0.0	99.7
125	127	Gastroenteritis	102	0.0	99.7
126	095	Angina & Chest Pain	96	0.0	99.7
127	212	Blood & Blood Forming Organ Disease	88	0.0	99.8
128	178	Psychiatric Disorders, Age 36 or Older	85	0.0	99.8
129	060	Open Wounds w/o Other Injury	82	0.0	99.8
130	213	Metabolic & Endocrine Disorders	76	0.0	99.8
131	126	Liver/Gallbladder/Pancreas Disorders	73	0.0	99.8
132	003	Fracture/Dislocation of Fingers & Toes	70	0.0	99.8
133	065	Death, except Trauma	68	0.0	99.8
134	206	Certain Serious Infectious Diseases	63	0.0	99.9

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
135	034	Foreign Body, except Ear, Eye & Nose	52	0.0	99.9
136	007	Other Fractures & Dislocations	49	0.0	99.9
137	129	Appendicitis	49	0.0	99.9
138	103	Asthma, Age <36	43	0.0	99.9
139	015	Open Wounds w/ Other Injury	42	0.0	99.9
140	022	Sprain Neck w/ Other Injury	41	0.0	99.9
141	174	Convulsions	38	0.0	99.9
142	096	Dysrhythmia & Conductive Disorder	36	0.0	99.9
143	173	Cerebrovascular Disease	34	0.0	99.9
144	016	Open Wounds of Hands & Feet w/ Other Injury	31	0.0	99.9
145	130	Gastrointestinal Hemorrhage	31	0.0	99.9
146	055	Fracture w/ Other Injury	24	0.0	99.9
147	100	Chronic Obstructive Pulmonary Disease	23	0.0	99.9
148	092	Hypertension	20	0.0	99.9
149	128	Intestinal Obstruction & Diverticulitis	19	0.0	99.9
150	104	Asthma, Age 36 or Older	18	0.0	99.9
151	215	Certain Serious Infectious Diseases	18	0.0	99.9
152	214	Minor Systemic Infectious Diseases	17	0.0	99.9
153	027	Contusions, Multiple Sites	16	0.0	99.9
154	010	Head Injury w/ Concussion or Fracture	15	0.0	99.9
155	057	Head Injuries	15	0.0	99.9
156	093	Acute Myocardial Infarction, Age <65	14	0.0	99.9
157	061	Burns	13	0.0	99.9
158	063	Poisonings, Drug	13	0.0	99.9
159	097	Congestive Heart Failure	13	0.0	99.9
160	175	Syncope & Collapse	8	0.0	99.9
161	005	Fracture/Dislocation of Nose w/ Other Injury	7	0.0	99.9
162	094	Acute Myocardial Infarction	6	0.0	99.9
163	153	Newborn Disorders	6	0.0	99.9
164	102	Lower Respiratory Disease, Age 65 or Older	5	0.0	99.9
165	066	Hypovolemia	4	0.0	99.9
166	001	Trauma & Poisoning Death	3	0.0	99.9
167	085	Hyperventilation	3	0.0	99.9
168	012	Head Injury w/o Concussion or Fracture	2	0.0	99.9
169	058	Internal Injuries	2	0.0	99.9
170	059	Open Wounds w/ Other Injury	2	0.0	99.9

Item Number	EDG Group Number	Emergency Department Group (EDG) Title or Description	Number of Visits	Percent of Visits (%)	Cumulative Percent (%)
171	090	Cardiopulmonary Disorders w/ Critical Care Procedure	2	0.0	99.9
172	064	Poisonings, Non-Drug	1	0.0	99.9
173	091	Hypovolemia	1	0.0	99.9
174	099	Pulmonary Edema	1	0.0	99.9
175	211	Miscellaneous Disorders	1	0.0	100.0
		TOTAL	509,073	100.0	100.0

Review of Table 15 indicates that of the 216 groups comprising the EDGs only 175 or 81% of the groups were utilized. While this was representative of 6% (14 more groups) improvement over the ED sample it was still smaller than what had been originally expected. For the remaining 41 EDGs that were not utilized, a clinical review was conducted. Similar to the ED sample, 30 of the EDGs that were not utilized required transfer information which was not available. Two other EDGs involved rape as a diagnosis and one other EDG required specific prior coding knowledge. Based on grouping results and Table 15 review, 208 of the 216 EDGs (96%) were used. Why the remaining eight EDGs were not used is not clear. A listing of the unused groups are contained in Appendix C. In order to gain a better understanding of the distribution of EDG visits, an analysis was conducted to construct a frequency distribution of the range of visits by EDGs.

Table 16 Number and Percent of Visits in Sample 1 Data Assigned to EDGs in Ranges

Number of Visits Assigned to an EDG (Ranges)	EDGs in Range		Visits in Range	
	Number	Percent	Number	Percent
0	41	18.98	0	0
1-29	30	13.89	292	.06
30-100	20	9.26	1147	.22
101-1000	64	29.63	27733	5.45
1001-5000	39	18.06	105455	20.72
5001 - 10000	11	5.09	77739	15.27
10001 or more	11	5.09	296707	58.28
TOTAL	216	100.00	509073	100.00

Table 16 demonstrates that 41 or 19% of the EDGs did not contain a single visit and 50 additional EDGs only had 100 or less visits. In summary, 42% of the EDGs contained less than 100 visits.

Cost Analysis

The analysis of Sample 1 was conducted in the same manner as the ED sample.

TABLE 17 Characteristics of Sample 1 Cost Distribution After EDG Groupings

(145 groups, 508,781 patient visits)

COST ALGORITHM	MEAN SKEWNESS	MEAN KURTOSIS
COST1	3.4047	25.1667
LOGCOST1	0.1524	0.6826
COST2	4.8925	62.2201
LOGCOST2	1.0504	1.6616
COST3	4.0702	34.7335
LOGCOST3	0.0774	1.0074
COST4	3.1081	19.5209
LOGCOST4	0.6921	0.1472

Table 17 demonstrates the amount of skewness and kurtosis before and after logarithmic transformation of the cost variables. As is readily seen, the logarithmic transformation of the cost variables provides a closer approximation to a normal distribution. The next step was to analyze the variance. The General Linear Models (GLM) analyses on Sample 1 using the four cost algorithms is presented results are presented in Table 18.

TABLE 18 Summary of General Linear Models Analysis of Sample 1 Pre and Post Log Transformation

COST VARIABLE	R-SQUARE	CV
COST1	0.0695	88.8599
LOGCOST1	0.0815	18.1460
COST2	0.0736	88.0458
LOGCOST2	0.1454	12.8442
COST3	0.0896	103.4778
LOGCOST3	0.1180	40.8021
COST4	0.0906	121.9088
LOGCOST4	0.1042	36.8943

Table 18 demonstrates that the use of LOGCOSTS improved the amount of variance explained by a modest amount and the smaller coefficients of variation indicate a substantial decrease in the dispersion in comparison to the mean. The grouper's performance on Sample 1 differs in that LOGCOST2 (CHAMPUS cost) appears most effective and LOGCOST1 (complete military cost) appears least effective.

The next step in the analysis process was to trim the data to three standard deviations from the mean, thus reducing the effect of the outliers. As noted earlier, this followed the methodology utilized by the developers of the EDGs. Two GLMs were performed using cost and the logarithm transformations of the cost. In Table 18 this resulted in modest improvement in the amount of variance explained by the cost formulas. The amount of variance explained ranges from almost 10% with COST1 and almost 14% with COST2; only COST2 improves with log values. The smaller CVs seen with LOGCOSTS indicate less dispersion in comparison to the mean.

TABLE 19 Summary of General Linear Models of Sample 1 Using ACES Cost Formulas, Trimmed to Three Standard Deviations from the Mean

COST VARIABLE	R-SQUARE	CV	# TRIMMED VISITS
COST1	0.0954	78.7014	2,503
LOGCOST1	0.0891	17.7346	2,503
COST2	0.1350	69.1002	4,996
LOGCOST2	0.1757	12.0522	4,996
COST3	0.1323	87.2232	3,629
LOGCOST3	0.1290	39.5863	3,629
COST4	0.1226	114.5159	3,272
LOGCOST4	0.1166	36.3266	3,272

The next series of GLMs were performed after the data had been trimmed to 2 standard deviations from the mean. This was done to reduce the effects of outliers and to compare the results of this grouper to other grouping systems, which employ more stringent criteria. As was the case earlier, both costs and the logarithm of the cost were used. Table 19 illustrated the modest improvement in the amount of variance explained by the cost formulas. The amount of variance explained ranged from almost 10% with COST1 (complete military cost) to almost 14% with COST2 (CHAMPUS cost). Only COST2 benefits from the logarithm transformation. The smaller coefficients of variation (CV)

resulting from the logarithm costs indicate less dispersion (variability) around the mean. Table 20 contains a comparative analysis of the effects of trimming the data and use of logarithmic transformations.

TABLE 20 Summary of General Linear Models of Sample 1 Using ACES Cost Formulas, Trimmed to Two Standard Deviations from the Mean

COST VARIABLE	R-SQUARE	CV	# TRIMMED VISITS
COST1	0.2193	78.5345	53
LOGCOST1	0.2146	17.3339	53
COST2	0.1868	48.0967	635
LOGCOST2	0.1568	10.3760	635
COST3	0.1888	88.3410	1,223
LOGCOST3	0.1630	30.4580	1,223
COST4	0.2145	83.1105	571
LOGCOST4	0.1958	29.9984	571

TABLE 21 Comparative Analysis Sample 1 General Linear Models with Cost Methodologies and Logarithmic Transformations, Untrimmed Data and Data Trimmed at Two and Three Standard Deviations From the Mean

COST VARIABLE	R-SQUARE	C V	# TRIMMED VISITS
COST1	0.0695	88.8599	0
COST1 (3 SD)	0.0954	78.7014	2,503
COST1 (2 SD)	0.1310	59.4187	29,681
LOGCOST1	0.0815	18.1480	0
LOGCOST1 (3 SD)	0.0891	17.7346	2,503
LOGCOST1 (2 SD)	0.1036	15.1190	29,681
COST2	0.0736	88.0458	0
COST2 (3 SD)	0.1350	69.1002	4,996
COST2 (2 SD)	0.1953	54.9111	24,341
LOGCOST2	0.1454	12.8442	0
LOGCOST2 (3 SD)	0.1757	12.0522	4,996
LOGCOST2 (2 SD)	0.2186	10.7163	24,341
COST3	0.0896	103.4778	0
COST3 (3 SD)	0.1323	87.2232	3,629
COST3 (2 SD)	0.1993	69.4873	29,972
LOGCOST3	0.1180	40.8021	0
LOGCOST3 (3 SD)	0.1290	39.5863	3,629
LOGCOST3 (2 SD)	0.1750	32.9668	29,972
COST4	0.0906	121.9088	0
COST4 (3 SD)	0.1226	114.5159	3,272
COST4 (2 SD)	0.1783	100.0221	17,799
LOGCOST4	0.1042	36.8943	0
LOGCOST4 (3 SD)	0.1166	36.3266	3,272
LOGCOST4 (2 SD)	0.1488	34,6705	17,799

Table 21 summarizes the GLM results on Sample 1 using ACES cost formulas.

DISCUSSION

The EDG developers noted that their study was limited by the relatively small sample size, i.e., about 20,000 visits from three EDs. Some of the groups in the Cameron study (1990) had relatively few patients, particularly in the transfer and admit categories. Certain groups were defined based on expected distinct resource use and clinical characteristics. Some groups had small cell size; therefore reliable relative values could not be determined. HSR, Inc. noted that the generalizability of the patient classification system developed from the data of three hospitals may be limited. For example, physician practice styles may vary considerably in different hospitals and geographic areas and may cause significant variation in resource use. EDs of major teaching hospitals may be organized and staffed quite differently than the hospitals in the HSR, Inc. study.

HRS, Inc. maintains that the EDGs may provide incentives to reduce the utilization of unnecessary ancillary services. Under current charge based reimbursement, hospitals have clear incentives to maximize the use of ancillaries in order to maximize revenue. Increased utilization of ancillary procedures may be in part a result of increase malpractice litigation. The practice "defensive medicine" has resulted in the ordering of ancillary tests which may not be clinically essential but which may potentially protect the practitioner in the event of litigation. Determining the right number and type of ancillaries to balance the need for cost containment, adequate care and "malpractice prevention" will likely be a difficult task for practitioners and administrators in the foreseeable future.

The ACES evaluation of the EDGs addressed the following four issues: (a) clinical meaningfulness, (b) administrative ease of implementation, (c) statistical analysis of the grouper results, and (d) military applicability.

The ACES team found that the EDG groups were partitioned using sound medical logic. The EDGs grouped 99% of the ED sample and 98% of Sample 1. Those records that did not group to any EDG contained basic coding errors. However, many of the EDGs could not be filled with the ACDB records due to administrative problems.

The EDG classification algorithm is very complex in terms of variable requirements compared to other major ambulatory classification systems such as the Products of Ambulatory Care (PACs), Products of Ambulatory Surgery (PASs), Ambulatory Visit Groups (AVGs), Ambulatory Classification Group (ACGs), and Ambulatory Patient Groups (APGs). These systems limit required variables to age, gender, procedure, and diagnoses. The EDGs require these variables plus secondary diagnoses, more

specificity in terms of procedures (i.e., length of sutures, size of wounds), and specific disposition (i.e., home, transfer, and admit). Some of these variables are not routinely collected in hospital ambulatory information systems.

The ACDB did not contain "transfer" disposition information which is needed for 30 EDGs. Twenty EDGs require a secondary diagnosis of injury or disorder. Careful ranking of primary and secondary diagnoses is essential for successful grouping. The ACDB contains up to 15 secondary diagnoses but these are not ranked in order of significance. A clinical review of EDG 8, (which requires a secondary diagnosis of injury) was conducted on Sample 1 data (n=524). The EDG grouper appears to "look" for a diagnosis in the secondary field but it does not "check" to make sure it differs from the primary diagnosis. EDG 107 requires a secondary diagnosis of a disorder. Clinical review of Sample 1 data (n=479) showed a much lower incidence of identical primary and secondary diagnoses (0.8%). It was noted however, that the secondary diagnosis appeared more significant than the primary diagnosis (as with the primary diagnosis of nausea and vomiting, and the secondary diagnosis of gastrointestinal bleeding.) These problems indicate mistakes made by the provider/coder. Corrections would require an individual record review.

EDGs 35 or 36 require rape as a diagnosis. The ACDB linked name, social security number, and diagnosis. These diagnoses with ACDB were probably not utilized due to confidentiality issues. EDG 37 "Home, Observation Following Accident or Injury" require special instructions which would require some prior knowledge of coding requirements for this EDG.

There were 22 EDGs in the ED sample and 8 in Sample 1 that were not utilized for unknown reasons. We had thought that our ED sample may have been biased due to the common practice of triaging patients to specialty clinics on a walk-in basis. When Sample 1 data was grouped, an additional 14 EDGs were utilized. Six of these involved trauma/injury and two involved genitourinary problems. Some of these visits may have been triaged from the ED to specialty clinics. Eight EDGs (14, 18, 26, 53, 125,and 172) were not utilized by either the ED or Sample 1 data. This was perplexing because one would expect to see three of these EDGs utilized because of the Level I EMS represented in the data. EDG 53 is "Admit, Penetrating Trauma" and 125 is "Admit, Gastrointestinal Disorder with Critical Care Procedure." The remaining EDGs may not have been utilized because either the disposition was unusual for the military system (EDGs 14 and 18), the patient type would be unusual (152 "Admit, Normal Newborn"), or possibly no patients in that category were seen (26 and 172).

Statistical analyses of the EDG grouper using the cost formulas developed by the ACES team on the untrimmed ED sample resulted in r-squares varying from 0.07 to 0.14 (i.e., accounting for 7-14% of the variance) depending on the formula.

Logarithmic transformed costs resulted in r-squares which varied from 0.10 to 0.14. When outliers were trimmed to 3 standard deviations from the mean, the r-squares of the costs varied from about 0.10 to 0.15, and LOGCOSTS r-squares varied from about 0.11 to 0.16. When more liberal trimming of outliers to 2 standard deviations from the mean was performed, the r-squares for the ACES costs varied from about 0.19 to 0.22, and LOGCOSTS r-squares varied from about 0.16 to 0.21. These r-square ranges are summarized below in Table 22.

TABLE 22 Emergency Department Sample R-Square Ranges

	UNTRIMMED	3 SD	2 SD
COST	0.07-0.14	0.10-0.15	0.19-0.22
LOGCOST	0.10-0.14	0.11-0.16	0.16-0.21

Similarly, statistical analyses of the EDG grouper using the cost formulas developed by the ACES team on the untrimmed Sample 1 resulted in r-squares varying from about 0.07 to 0.09 (i.e., accounting for 7-9% of the variance) depending on the formula. Logarithmical transformed costs resulted in r-squares which varied from about 0.08 to 0.14. When the data was trimmed to 3 standard deviations from the mean, the r-squares of the costs varied from about 0.10 to 0.14, and LOGCOST r-squares varied from about 0.09 to 0.18. Trimming of outliers to 2 standard deviations results in cost r-squares ranging from 0.13 to 0.20, and LOGCOST r-squares from 010 to 0.22. These r-square ranges are summarized below in Table 23.

TABLE 23 Sample 1 R-Square Ranges

UNTRIMMED		3 SD	2 SD
COST	0.07-0.09	0.10-0.14	0.13-0.20
LOGCOST	0.08-0.14	0.09-0.18	0.10-0.22

These low r-squares may be due to a number of factors. The first is the rudimentary nature of the ACES cost methodology. The second may lie in the difference in the EDG cost methodology which is charge-based and the ACES cost methodology which attempts to capture some idea of actual costs. Third, is the use

of a statistical measure which is very sensitive to nonnormality in a distribution of the measurement variable. Fourth, is the difficulty in applying any grouper to a different sample than that from which it was developed. In attempt to address some of these identified difficulties, the ACES team has applied the same bias effect of the cost methodologies (if it exists) to all ambulatory patient classification systems under study. The team also utilized statistical techniques, including log transformations of the costs and data trimming in an effort to "normalize" the data and optimize results.

The evaluation of the applicability of the EDGs to a military environment raised a number of issues. First, the demographic data indicate that the total military beneficiary population (i.e., active duty, retirees, children, spouses) crosses all groups. Additionally, as other studies have indicted the military beneficiary also represents a cross-section of social-economic levels. A strong case can be made that the military medical consumer is more similar to the civilian medical consumer than some have previously believed.

The implementation of any ambulatory classification system in the military presents significant problems. The current method of entering ambulatory visit data in the outpatient medical record is inadequate for the purposes of a prospective payment system. An automated system for the gathering of grouper variables would be essential. The ACDB study found that providers were often unwilling to duplicate their documentation requirements, which in some cases led to inconsistent data collection. The development of a single system which eliminates providers having to duplicate their documentation requirements is critical to the implementation of an ambulatory classification system. If available, clinic support personnel could collect patient demographic information. However, given the current shortage of support personnel this may not be a feasible alternative. Military providers tend to be unfamiliar with both CPT and ICD-9-CM. Knowledge of these systems is essential for the successful implementation of any classification system. Moreover, the use of the EDG system would require additional training of providers in the collection of required variables which are more extensive than other classification systems but are essential for appropriate grouping.

CONCLUSION

HSR, Inc. acknowledges that the EDGs in their current form are a prototype. ACES evaluation verifies the need for further development specifically in the areas of the required data elements and in the grouping algorithm.

The implementation for any prospective payment system for ambulatory care would be more difficult than that experienced with the DRGs in the inpatient setting. Experience and use of diagnostic and procedural coding in the ambulatory setting is limited. Currently, hospital based ambulatory clinics lack the ability to link departmental cost and billing data to patient clinical data. Hospital Outpatient Departments (OPDs) would have to develop automated systems to link financial and clinical data, and become proficient at diagnostic coding. A standardized ambulatory medical record would have to be developed which contained the necessary information in the required form (diagnosis, procedure, disposition, etc.). This record should require one-time documentation of essential information.

The meaningful implementation of any outpatient payment system, for the military or civilian community, would require the development of a standard costing methodology. The health care industry uses standard CPT-4 codes, ICD-9-CM codes, provider type and clinic type in an effort to develop patient groups that are clinically meaningful. The development of standardized costing methodology which accurately compares the cost of ambulatory care is more critical. Charge based methodology provides inaccurate measures of cost. Without accurate cost methodology the reliability of any ambulatory classification system cannot be accurately assessed.

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APPENDIX A

LIST OF EMERGENCY DEPARTMENT GROUPS (EDGs)

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
001	Expired	Trauma and Poisoning Death
002	Home	Shoulder Dislocation
003	Home	Fracture/Dislocation of Fingers and Toes with Other Injury
004	Home	Fracture/Dislocation of Fingers and Toes without Other Injury
005	Home	Fracture/Dislocation of Nose with Other Injury
006	Home	Fracture/Dislocation of Nose without Other Injury
007	Home	Other Fractures and Dislocations with Multiple Other Injuries
008	Home	Other Fractures and Dislocations with Single Other Injury
009	Home	Other Fractures and Dislocations without Other Injury
010	Home	Head Injury with Concussion or Fracture, with Other Injury
011	Home	Head Injury with Concussion or Fracture, without Other Injury
012	Home	Head Injury without Concussion or Fracture, with Other Injury
013	Home	Head Injury without Concussion or Fracture, without Other Injury
014	Home	Open Wounds with Other Injury, with Complex Procedure
015	Home	Open Wounds with Other Injury, with Simple Procedure
016	Home	Open Wounds of Hands and Feet, with Other Injury, without Procedure
017	Home	Open Wounds, except Hands and Feet, with Other Injury, without Procedure
018	Home	Open Wounds without Other Injury, with Complex Procedure
019	Home	Open Wounds without Other Injury, with Simple Procedure
020	Home	Open Wounds of Hands and Feet, without Other Injury, without Procedure
021	Home	Open Wounds, except Hands and Feet, without Other Injury
022	Home	Sprain Neck with Other Injury
023	Home	Sprain Neck without Other Injury
024	Home	Sprains, except Neck, with Other Injury
025	Home	Sprains, except Neck, without Other Injury
026	Home	Contusions of Fingers and Toes
027	Home	Contusions, Multiple Sites or Multiple Other Injuries
028	Home	Contusions, except Fingers and Toes, with Single Other Injury
029	Home	Contusions, except Fingers and Toes, without Other injury
030	Home	Burns
031	Home	Insect Bites (Non-Poisonous)

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
032	Home	Abrasions
033	Home	Foreign Body of Eye, Ear and Nose
034	Home	Foreign Body, except Eye, Ear and Nose
035	Home	Rape with Other Injury
036	Home	Rape without Other Injury
037	Home	Observation Following Accident or Injury
038	Home	Other Injuries
039	Home	Poisonings, Drug
040	Home	Poisonings, Non-Drug
041	Transfer	Trauma and Poisoning with Critical Care Procedure
042	Transfer	Penetrating Trauma (Gunshot or Stab Wound)
043	Transfer	Fractures and Dislocations with Other Injury
044	Transfer	Fractures and Dislocations without Other Injury
045	Transfer	Head Injury
046	Transfer	Internal Injury
047	Transfer	Open Wounds with Other Injury
048	Transfer	Open Wounds without Other Injury
049	Transfer	Burns
050	Transfer	Other Injuries
051	Transfer	Poisonings, Drug
052	Transfer	Poisonings, Non-Drug
053	Admit	Trauma and Poisonings with Critical Care Procedure
054	Admit	Penetrating Trauma (Gunshot or Stab Wound)
055	Admit	Fracture with Other Injury
056	Admit	Fracture without Other Injury
057	Admit	Head Injuries
058	Admit	Internal Injuries
059	Admit	Open Wounds with Other Injury
060	Admit	Open Wounds without Other Injury
061	Admit	Burns
062	Admit	Other Injuries
063	Admit	Poisonings, Drug
064	Admit	Poisonings, Non-Drug
065	Expired	Death, except Trauma
066	Home	Hypovolemia
067	Home	Hypertension, Age <65

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
068	Home	Hypertension, Age 65 or Older
069	Home	Angina
070	Home	Dysrhythmia and Conductive Disorders, Age <36
071	Home	Dysrhythmia and Conductive Disorders, Age 36-65
072	Home	Dysrhythmia and Conductive Disorders, Age 65 or Older
073	Home	Heart Failure (Stable)
074	Home	Chest Pain, Age <36
075	Home	Chest Pain, Age 36 or Older
076	Home	Other Circulatory System Disorders
077	Home	Upper Respiratory Infection, Age <65
078	Home	Upper Respiratory Infection, Age 65 or Older
079	Home	Sinus Disorders
080	Home	Lower Respiratory Disease, Age <65
081	Home	Lower Respiratory Disease, Age 65 or Older
082	Home	Chronic Obstructive Pulmonary Disease
083	Home	Asthma, Age <36
084	Home	Asthma, Age 36 or Older
085	Home	Hyperventilation
086	Home	Other Respiratory Disorders
087	Transfer	Cardiopulmonary Disorders with Critical Care Procedure
088	Transfer	Cardiopulmonary Disorders, Age <65
089	Transfer	Cardiopulmonary Disorders, Age 65 or Older
090	Admit	Cardiopulmonary Disorders with Critical Care Procedure
091	Admit	Hypovolemia
092	Admit	Hypertension
093	Admit	Acute Myocardial Infarction, Age <65
094	Admit	Acute Myocardial Infarction, Age 65 or Older
095	Admit	Angina and Chest Pain
096	Admit	Dysrhythmia and Conductive Disorder
097	Admit	Congestive Heart Failure
098	Admit	Other Circulatory System Disorders
099	Admit	Pulmonary Edema
100	Admit	Chronic Obstructive Pulmonary Disease
101	Admit	Lower Respiratory Disease, Age <65
102	Admit	Lower Respiratory Disease, Age 65 or Older
103	Admit	Asthma, Age <36

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
104	Admit	Asthma, Age 36 or Older
105	Admit	Other Respiratory Disorders
106	Home	Oral Disorders
107	Home	Esophagus and Stomach Disorders, Age <36 with Other Disorder
108	Home	Esophagus and Stomach Disorders, Age <36 without Other Disorder
109	Home	Esophagus and Stomach Disorders, Age 36 or Older, with Other Disorder
110	Home	Esophagus and Stomach Disorders, Age 36 or Older, without Other Disorder
111	Home	Intestinal Obstruction and Diverticulitis
112	Home	Gastroenteritis, Age <36
113	Home	Gastroenteritis, Age 36 or Older
114	Home	Constipation
115	Home	Liver/Gallbladder/Pancreas Disorders, Age <36
116	Home	Liver/Gallbladder/Pancreas Disorders, Age 36 or Older
117	Home	Rectal Disorders
118	Home	Appendicitis
119	Home	Hernia
120	Home	Other Gastrointestinal Disorders, Age <36
121	Home	Other Gastrointestinal Disorders, Age 36 or Older
122	Transfer	Gastrointestinal Disorders with Critical Care Procedure
123	Transfer	Gastrointestinal Disorders, Age <36
124	Transfer	Gastrointestinal Disorders, Age 36 or Older
125	Admit	Gastrointestinal Disorders with Critical Care Procedure
126	Admit	Liver/Gallbladder/Pancreas Disorders
127	Admit	Gastroenteritis
128	Admit	Intestinal Obstruction and Diverticulitis
129	Admit	Appendicitis
130	Admit	Gastrointestinal Hemorrhage
131	Admit	Other Gastrointestinal Disorders
132	Home	Urinary Tract Infection, Age <65 with Other Disorder
133	Home	Urinary Tract Infection, Age <65 without Other Disorder
134	Home	Urinary Tract Infection, Age 65 or Older
135	Home	Urinary Calculus
136	Home	Gonococcal and Non-Gonococcal Urethritis
137	Home	Male Genital Disorders
138	Home	Urethral Stricture
139	Home	Other Genitourinary Disorders

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
140	Transfer	Genitourinary Disorders
141	Admit	Genitourinary Disorders
142	Home	Pelvic Inflammatory Disease
143	Home	Vaginal, Vulvar and Menstrual Disorders
144	Home	Ovarian Cyst
145	Home	Breast Disorders
146	Home	Complications of Pregnancy
147	Home	Other Obstetric Gynecological Disorders
148	Home	Newborn Disorders
149	Transfer	Obstetric, Gynecological and Newborn Disorders
150	Admit	Obstetrics Disorders
151	Admit	Gynecological Disorders
152	Admit	Normal Newborn
153	Admit	Newborn Disorders
154	Home	Cerebrovascular Disease
155	Home	Convulsions, Age <36 with Other Disorder
156	Home	Convulsions, Age <36 without Other Disorder
157	Home	Convulsions, Age 36 or Older
158	Home	Headache
159	Home	Syncope and Collapse
160	Home	Vertigo, Age <65
161	Home	Vertigo, Age 65 or Older
162	Home	Other Neurologic Disorders
163	Home	Alcohol and Drug Dependence
164	Home	Psychiatric Disorders, Age <36
165	Home	Psychiatric Disorders, Age 36-65
166	Home	Psychiatric Disorders, Age 65 or Older
167	Transfer	Neurologic Disorder with Critical Care Procedure
168	Trar sfer	Cerebrovascular Disease
169	Transfer	Convulsions
170	Transfer	Other Neurologic Disorders
171	Transfer	Psychiatric Disorders
172	Admit	Neurologic Disorders with Critical Care Procedure
173	Admit	Cerebrovascular Disease
174	Admit	Convulsions
175	Admit	Syncope and Collapse

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
176	Admit	Other Neurologic Disorders
177	Admit	Psychiatric Disorders, Age <36
178	Admit	Psychiatric Disorders, Age 36 or Older
179	Home	Eyelid Disorders
180	Home	Conjunctivitis
181	Home	Other Eye Disorders
182	Home	Otitis Media
183	Home	Otitis Externa
184	Home	Other Ear Disorders
185	Home	Epistaxis
186	Transfer	Eye, Ear and Nose Disorders
187	Admit	Eye, Ear and Nose Disorders
188	Home	Skin and Subcutaneous Infections
189	Home	Non-Infective Dermatological Disorders
190	Home	Joint Disease, Age <65
191	Home	Joint Disease, Age 65 or Older
192	Home	Spinal Disease, Age <36
193	Home	Spinal Disease, Age 36 or Older
194	Home	Bone Disease
195	Transfer	Skin Disorders
196	Transfer	Musculoskeletal Disorders
197	Admit	Skin Disorders
198	Admit	Musculoskeletal Disorders
199	Home	Follow-Up and Aftercare
200	Home	Administrative and Other Well-Patient Visits
201	Home	Blood and Blood Forming Organ Disease
202	Home	Metabolic and Endocrine Disorders, Age <36
203	Home	Metabolic and Endocrine Disorders, Age 36 or Older
204	Home	Allergic Reaction
205	Home	Minor Systemic Infectious Diseases
206	Home	Certain Serious Infectious Diseases
207	Home	Unspecified and Ill-Defined, Age <36
208	Home	Unspecified and Ill-Defined, Age 36 or Older
209	Transfer	Miscellaneous Disorders with Critical Care Procedure
210	Transfer	Miscellaneous Disorders without Critical Care Procedure
211	Admit	Miscellaneous Disorders with Critical Care Procedure

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
212	Admit	Blood and Blood Forming Organ Disease
213	Admit	Metabolic and Endocrine Disorders
214	Admit	Minor Systemic Infectious Diseases
215	Admit	Certain Serious Infectious Diseases
216	Admit	Unspecified and Ill-Defined Disorders

APPENDIX B

EMERGENCY DEPARTMENT GROUPS WHICH WERE EMPTY AFTER GROUPING THE EMERGENCY DEPARTMENT SAMPLE

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
007	Home	Other Fractures and Dislocations with Multiple other Injuries
012	Home	Head Injury without Concussion or Fracture, with Other Injury
014	Home	Open Wounds with Other Injury, with Complex Procedure
016	Home	Open Wounds of Hands and Feet, with Other Injury, without Procedure
018	Home	Open Wounds without Other Injury, with Complex Procedure
020	Home	Open Wounds of Hands and Feet, without Other Injury, without Procedure
026	Home	Contusions of Fingers and Toes
027	Home	Contusions, Multiple Sites or Multiple Other Injuries
035	Home	Rape with Other Injury
036	Home	Rape without Other Injury
037	Home	Observation Following Accident or Injury
041	Transfer	Trauma and Poisoning with Critical care Procedure
042	Transfer	Penetrating Trauma (Gunshot or Stab Wound)
043	Transfer	Fractures and Dislocations with Other Injury
044	Transfer	Fractures and Dislocations without Other Injury
045	Transfer	Head Injury
046	Transfer	Internal Injury
047	Transfer	Open Wounds with Other Injury
048	Transfer	Open Wounds without Other Injury
049	Transfer	Burns
050	Transfer	Other Injuries
051	Transfer	Poisonings, drug
052	Transfer	Poisonings, Non-Drug
053	Admit	Trauma and Poisonings with Critical Care Procedure
054	Admit	Penetrating Trauma (Gunshot or Stab Wound)
059	Admit	Open Wounds with Other Injury

066	Home	Hypovolemia
085	Home	Hyperventilation
087	Transfer	Cardiopulmonary Disorders with Critical Care Procedure
088	Transfer	Cardiopulmonary Disorders, Age <65
089	Transfer	Cardiopulmonary Disorders, Age 65 or Older
091	Admit	Hypovolemia
092	Admit	Hypertension
122	Transfer	Gastrointestinal Disorders with Critical Care Procedure
123	Transfer	Gastrointestinal Disorders, Age <36
124	Transfer	Gastrointestinal Disorders, Age 36 or Older
125	Admit	Gastrointestinal Disorders with Critical Care Procedure
138	Home	Urethral Stricture
140	Transfer	Genitourinary Disorders
144	Home	Ovarian Cyst
149	Transfer	Obstetric, Gynecological and Newborn Disorders
152	Admit	Normal Newborn
153	Admit	Newborn Disorders
167	Transfer	Neurologic Disorder with Critical Care Procedure
168	Transfer	Cerebrovascular Disease
169	Transfer	Convulsions
170	Transfer	Other Neurologic Disorders
171	Transfer	Psychiatric Disorders
172	Admit	Neurologic Disorders with Critical Care Procedure
186	Transfer	Eye, Ear and Nose Disorders
195	Transfer	Skin Disorders
196	Transfer	Musculoskeletal Disorders
209	Transfer	Miscellaneous Disorders with Critical Care Procedure
210	Transfer	Miscellaneous Disorders without Critical Care Procedure
215	Admit	Certain Serious Infectious Diseases

APPENDIX C

SAMPLE 1 GROUPS WHICH WERE EMPTY AFTER GROUPING THE SAMPLE

EDG Group Number	Patient Disposition Classification	Emergency Department Group (EDG) Title or Description
014	Home	Open Wounds with Other Injury, with Complex Procedure
018	Home	Open Wounds without Other Injury, with Complex Procedure
026	Home	Contusions of Fingers and Toes
035	Home	Rape with Other Injury
036	Home	Rape without Other Injury
037	Home	Observation Following Accident or Injury
041	Transfer	Trauma and Poisoning with Critical Care Procedure
042	Transfer	Penetrating Trauma (Gunshot or Stab Wound)
043	Transfer	Fractures and Dislocations with Other Injury
044	Transfer	Fractures and Dislocations without Other Injury
045	Transfer	Head Injury
046	Transfer	Internal Injury
047	Transfer	Open Wounds with Other Injury
048	Transfer	Open Wounds without Other Injury
049	Transfer	Burns
050	Transfer	Other Injuries
051	Transfer	Poisonings, Drug
052	Transfer	Poisonings, Non-Drug
053	Admit	Trauma and Poisonings with Critical Care Procedure
054	Admit	Penetrating Trauma (Gunshot or Stab Wound)
087	Transfer	Cardiopulmonary Disorders with Critical Care Procedure
088	Transfer	Cardiopulmonary Disorders, Age <65
089	Transfer	Cardiopulmonary Disorders, Age 65 or Older
122	Transfer	Gastrointestinal Disorders with Critical Care Procedure
123	Transfer	Gastrointestinal Disorders, Age <36
124	Transfer	Gastrointestinal Disorders, Age 36 or Older
125	Admit	Gastrointestinal Disorders with Critical Care Procedure
140	Transfer	Genitourinary Disorders
149	Transfer	Obstetric, Gynecological and Newborn Disorders
152	Admit	Normal Newborn
167	Transfer	Neurologic Disorder with Critical Care Procedure
168	Transfer	Cerebrovascular Disease
169	Transfer	Convulsions

170	Transfer	Other Neurologic Disorders
171	Transfer	Psychiatric Disorders
172	Admit	Neurologic Disorders with Critical Care Procedure
186	Transfer	Eye, Ear and Nose Disorders
195	Transfer	Skin Disorders
196	Transfer	Musculoskeletal Disorders
209	Transfer	Miscellaneous Disorders with Critical Care Procedure
210	Transfer	Miscellaneous Disorders without Critical Care Procedure

APPENDIX D

MORE SPECIFIC AMBULATORY CARE DATA BASE (ACDB) DIAGNOSIS CODES BY SPECIFIC CLINIC USED INSTEAD OF V655--NO PROBLEM NOTED

UCA CODE	CLINIC	ICD-9-CM	DESCRIPTION
BAAA	INTERNAL MEDICINE	V700	ROUTINE GENERAL MEDICAL EXAM
BABA	ALLERGY CLINIC	V718	OBSERVATION FOR OTHER SPECIFIED CONDITIONS
BACA	CARDIOLOGY	V717	OBSERVATION FOR OTHER SPECIFIED CONDITIONS
BAEA	DIABETIC CLINIC	25000	DIABETES MELLITUS WITHOUT MENTION OF COMPLICATION, UNSPECIFIED
BAFA	ENDOCRINOLOGY	V718	OBSERVATION OF OTHER SPECIFIED CONDITIONS
BAHA	HEMATOLOGY	V123	DISEASES OF BLOOD AND BLOOD-FORMING ORGANS
BAIA	HYPERTENSION	4019	ESSENTIAL HYPERTENSION, UNSPECIFIED
BAJA	NEPHROLOGY	V718	OBSERVATION FOR UNSPECIFIED SUSPECTED CONDITIONS
BAKA	NEUROLOGY	V124	DISORDERS OF THE NERVOUS SYSTEM AND SENSE ORGANS
BAMA	ONCOLOGY	V718	OBSERVATION FOR OTHER SPECIFIED SUSPECTED CONDITION
BANA	PULMONARY	V718	OBSERVATION FOR OTHER SPECIFIED SUSPECTED CONDITIONS
BAOA	RHEUMATOLOGY	V718	OBSERVATION FOR OTHER SPECIFIED SUSPECTED CONDITIONS
BAPA	DERMATOLOGY	V133	DISEASES OF SKIN AND SUBCUTANEOUS TISSUE
BAQA	INFECTIOUS DISEASE	V120	INFECTIOUS AND PARASITIC DISEASES
BBAA	GENERAL SURGERY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BBAB	PAIN CONTROL	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BBBA	CARDIOVASCULAR/ THORACIC	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BBCA	NEUROSURGERY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BBDA	OPHTHALMOLOGY	V720	EXAMINATION OF EYES AND VISION

UCA CODE	CLINIC	ICD-9-CM	DESCRIPTION
BBFA	OTORHINOLARYNGOLOGY (ENT)	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BBGA	PLASTIC SURGERY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BBHA	PROCTOLOGY	V718	OBSERVATION FOR OTHER SPECIFIED SUSPECTED CONDITIONS
BBIA	UROLOGY	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BBJA	PEDIATRIC SURGERY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BCAA	FAMILY PLANNING	V2509	CONTRACEPTIVE MANAGEMENT, OTHER
BCBA	GYNECOLOGY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BCCA	OBSTETRICS	V221	SUPERVISION OF OTHER NORMAL PREGNANCY
BCCB	ANTEPARTUM	V221	SUPERVISION OF OTHER NORMAL PREGNANCY
BCCC	MIDWIFERY SERVICES	V221	SUPERVISION OF OTHER NORMAL PREGNANCY
BDAA	PEDIATRIC	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BDBA	ADOLESCENT	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BDCA	WELL BABY	V202	ROUTINE INFANT OR CHILD HEALTH CHECK
BDZA	EXCEPTIONAL MEMBER PROGRAM	V619	UNSPECIFIED FAMILY CIRCUMSTANCES
BEAA	ORTHOPEDIC	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BECA	HAND SURGERY	V670	FOLLOW-UP EXAM FOLLOWING SURGERY
BEDA	NEUROMUSCULOSKELETAL	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BEFA	PODIATRY	V6759	FOLLOW-UP EXAM FOLLOWING OTHER TREATMENT
BFEA	SOCIAL WORK	V629	UNSPECIFIED PSYCHOSOCIAL CIRCUMSTANCE
BHCA	OPTOMETRY	V720	EXAMINATION OF EYES AND VISION

UCA CODE	CLINIC	ICD-9-CM	DESCRIPTION
BHCH	TMC 11 OPTOM (FT BRAGG)	V720	EXAMINATION OF EYES AND VISION
BHDA	AUDIOLOGY	V721	EXAMINATION OF EARS AND HEARING
BAGA	GASTROENTEROLOGY	V718	OBSERVATION FOR OTHER SPECIFIED SUSPECTED CONDITIONS
BALA	NUTRITION	V653	DIETARY SURVEILLANCE AND COUNSELING
BHCI	TMC FT CAMP OPTOMETRY	V720	EXAMINATION OF EYES AND VISION
BHEA	SPEECH PATHOLOGY	V728	UNSPECIFIED EXAMINATION

LEAVE BIYA, EMERGENCY ROOM, AS V655, ALL REMAINING CLINICS (OTHER THAN THOSE ABOVE) MAP TO V700

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